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OF THE
SLEEPING SICKNESS COMMISSION.

No. IV.

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By Lieut.-Col. DAVID BRUCE, R.A.M.C., F.R.S., DAVID NABARRO, M.D., and Capt. E. D. W. GREIG, I.M.S.

Received September 30, 1903.

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Introductory.

Lieut.-Col. D. Bruce, R.A.M.C., and Dr. Nabarro, arrived in Entebbe, Uganda, on March 16, 1903, for the purpose of continuing the investigation of Sleeping Sickness, begun by Drs. Low, Castellani, and Christy in 1902.

On May 29, 1903, a report entitled "Progress Report on Sleeping Sickness in Uganda," was sent to the Royal Society. This was received on June 29, 1903, and published as No. 2 in the series entitled "Reports of Sleeping Sickness Commission."

Bruce and Nabarro were joined on May 25, 1903, by Capt. Greig, I.M.S., who was sent to Uganda, to study Sleeping Sickness, on behalf of the Indian Government, so that, since that date, the Commission has had the benefit of his energetic co-operation.

Lieut.-Col. Bruce left Entebbe for England on August 28, leaving Greig and Nabarro to continue the investigation.

This Further Report brings the account of the work done by the Commission up to the date of Col. Bruce's departure, and, in order to make it more easily understood, and to prevent the necessity of constant reference to the previous Progress Report, in certain places not very numerous, extracts from the latter have been incorporated into the present report.

For this, and for the mode of presentation of both reports, Lieut.-Col. Bruce is responsible.

Since this further report contains a good deal of detail, which may make it difficult to pick out easily the salient points, it may be well to point out at the outset that this report brings forward evidence to show—

1. That Sleeping Sickness is caused by the entrance into the blood and cerebro-spinal fluid of a species of trypanosoma.
2. That this species is probably that discovered by Forde and described by Dutton from the West Coast of Africa, and called by him *Trypanosoma Gambiense*.
3. That the so-called cases of trypanosoma fever, described from the West Coast, may be and probably are, cases of Sleeping Sickness in the earliest stages.
4. That monkeys are susceptible to Sleeping Sickness, and show the same symptoms, and run the same course, whether the trypanosomes injected are derived from cases of so-called trypanosoma fever, or from the cerebro-spinal fluid of cases of *Sleeping Sickness*.
5. That dogs and rats are partially susceptible, but that guinea-pigs, donkeys, oxen, goats, and sheep, up to the present, have shown themselves absolutely refractory.
6. That the trypanosomes are transmitted from the sick to the healthy by a species of tsetse fly, *Glossina palpalis*, and by it alone.
7. That the distribution of Sleeping Sickness and *Glossina palpalis* correspond.
8. That Sleeping Sickness is, in short, a human tsetse fly disease.

For the sake of the future historian, it may be well to point out the exact state of affairs as regards our knowledge of Sleeping Sickness in relation to trypanosomes, when Col. Bruce and Dr. Nabarro arrived in Entebbe, on March 16, 1903. Dr. Castellani had observed these hæmatozoa in the cerebro-spinal fluid of five cases of Sleeping Sickness, and in one of these he had also seen them in the blood.

At the time of the arrival of the Commission, he did not consider that this trypanosoma had any causal relationship to the disease, but thought that it was an accidental concomitant like *Filaria perstans*. When he reported his observation to Lieut.-Col. Bruce, the latter was much struck by the discovery, and urged Dr. Castellani to pursue this point during his few remaining days in Entebbe.

Dr. Moffat, the Principal Medical Officer of Uganda, Dr. Baker, the Resident Medical Officer at Entebbe, as well as Colonel and Mrs. Bruce worked from morning to night in co-operation with Dr. Castellani, in order to confirm his observation, with the result that, before he left for England on April 6, 34 cases of Sleeping Sickness and 12 controls had been examined, with a positive result in 70 per cent. of the former, and a negative result in the latter.

As Dr. Castellani has not entered into any detail respecting these matters in his reports, it is thought advisable to supplement his account with the above, as the true history of the discovery of the cause of any important disease must always be of interest.

This most interesting discovery of Dr. Castellani's, which was due to his introduction of the method of centrifuging the cerebro-spinal fluid in his search for his streptococcus, has been of the utmost possible value to the present Commission. It put them at once on the right track and led to the rapid and easy elucidation of the etiology of this hitherto mysterious disease. Without a knowledge of his observation they might have worked for months in the dark, and, in truth, they might even have returned to England still ignorant as to the true cause of the disease.

After Dr. Castellani's departure for England, the Commission continued this line of work, with the result that the cerebro-spinal fluid of every case of Sleeping Sickness examined was found to contain trypanosomes.

The members of the Commission take the earliest opportunity of expressing their heartiest thanks to Colonel Hayes-Sadler, C.B., His Majesty's Commissioner and Consul-General, Uganda, for his invariable kindness and good offices, to Dr. Moffat, C.M.G., who has been untiring in help, to Dr. Hodges, Acting Principal Medical Officer, during Dr. Moffat's absence, to Dr. Baker, the resident colonial surgeon in Entebbe, who has spent much of his leisure time in working with and for the Commission, to Dr. Wiggins, of Kisumu, who has given valuable assistance, to the sub-commissioners, collectors, and other officials of the Protectorate, to the bishops of the various churches and their missionaries, and lastly to the Prime Minister and Regents of Uganda, who are now helping to make out the distribution of tsetse flies in

Uganda, and have throughout shown great interest in the work. Our best thanks are also due to Professor Ray Lankester, the Director, and to Mr. Austen, the Entomologist of the British Museum for their kindness in naming the many species of biting flies sent to them from Uganda. In Mr. Austen's recent monograph of the tsetse flies, a full account of *Glossina palpalis* is given.

1. *The Cerebro-Spinal Fluid of Every Case of Sleeping Sickness taken by Lumbar Puncture during Life contains Trypanosomes.*

In the Progress Report, it was shown that, in every case of Sleeping Sickness, trypanosomes are found in the cerebro-spinal fluid, and a table giving in detail the examination of forty cases, was given.

It was also pointed out that the trypanosomes exist, as a rule, in very small numbers, and it may be considered impossible that such small numbers can bring about pathological changes, and be the cause of such a grave disease as Sleeping Sickness. If, however, we turn to another trypanosoma disease, Nagana in the native goat or sheep, we find the same scarcity of parasites. It is only rarely that the trypanosomes can be detected in the blood, and yet the disease invariably pursues its chronic course to a fatal termination.

2. *Trypanosomes occur in the Cerebro-Spinal Fluid of Cases of Sleeping Sickness in other Districts than Uganda.*

It will be remembered that almost all cases of Sleeping Sickness examined in Entebbe, show the presence in the blood of *Filaria perstans*, whereas blood examinations of cases of the same disease in Kavirondo, British East Africa, practically show no Filaria.

In the same way it may be that every case of Sleeping Sickness admitted to the Entebbe Hospital, from the surrounding district, may harbour trypanosomes, while cases occurring in Kavirondo may be free from them.

Dr. Wiggins who is stationed at Kisumu in Kavirondo, and is in charge of a Sleeping Sickness Hospital there, kindly undertook to examine cases for the Commission. He had been on leave in Entebbe for a fortnight in April, and had then been most energetic in examining cases, and hence was familiar with the methods used in demonstrating the parasites.

On May 25, he sent in his results which are as follows :—

Sleeping Sickness—

1st stage,	31	cases.	Trypanosomes	present in	31.
2nd ,,	15	,,	..	..	15.
3rd ,,	7	,,	..	..	7.

Dr. Wiggins is of opinion that the trypanosomes are much more numerous in the cases in Kavirondo than in Entebbe. If this is so, it is a curious fact, but until we have some more exact method of numeration, the observation must remain not proven.

The trypanosoma then is present in the cerebro-spinal fluid of all cases of Sleeping Sickness in Kavirondo, as well as in Uganda, and this, which seemed to us an important question, has been satisfactorily answered.

3. *The Cerebro-spinal Fluid taken by Lumbar Puncture from Cases of Disease other than Sleeping Sickness do not contain Trypanosomes.*

In the Progress Report, a table was given showing that trypanosomes were absent from the cerebro-spinal fluid of 15 cases admitted to hospital for various diseases other than Sleeping Sickness. Dr. Wiggins also writes that he has examined 7 cases of disease other than Sleeping Sickness at Kisumu, and failed to find trypanosomes in any of them.

From the above table and Dr. Wiggins' report, although the numbers are small, it would appear that the cerebro-spinal fluid taken by lumbar puncture during life from cases of disease other than Sleeping Sickness does not contain trypanosomes.

4. *The Peripheral Blood of all Cases of Sleeping Sickness also contains the Trypanosomes.*

This point was also dealt with in the progress report, with the result that it was shown that practically all cases of Sleeping Sickness harbour trypanosomes in the blood as well as in the cerebro-spinal fluid.

5. *Has the so-called Trypanosoma Fever any Connection with Sleeping Sickness?*

On the West Coast of Africa, during the past few years, trypanosomes have been found in the blood of several persons, and the name trypanosoma fever has been given to that disease. The parasites have not been confined to the blood of natives, but at least three white people have harboured them. No suspicion of these being cases of Sleeping Sickness has been entertained by those in medical charge of them. The symptoms are different. Trypanosoma fever appears to cause little or no inconvenience to those harbouring the parasite, whereas in Sleeping Sickness the disease is a well-marked one and is invariably fatal. Can there be any connection between the two?

In March last, Dr. Baker of the Colonial Service, who is stationed here, discovered trypanosomes in the blood of five natives, and

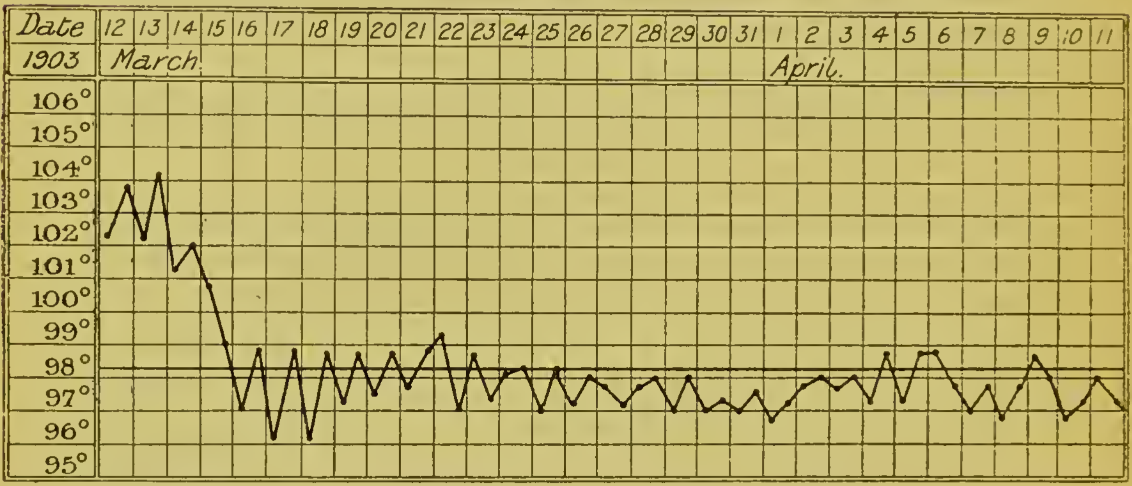
Dr. Moffat, the Principal Medical Officer, has also found them in the blood of a European.

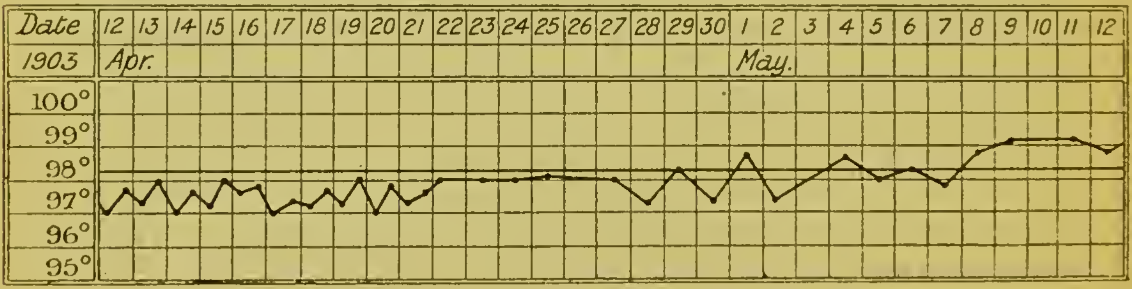
As we are face to face with a curious problem, we will with the permission of Drs. Moffat and Baker, give a temperature chart and a short description of each of these cases. The subject is an interesting and comparatively new one, and it will be seen that there is probably a close connection between the two diseases.

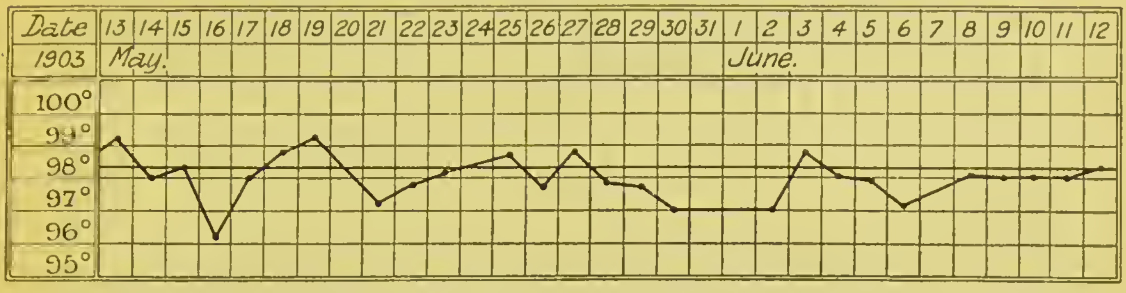
CASE 31.—Karala Barigi. Male. District, Singo. Occupation, Policeman. Tribe, Mundu, Nubian.

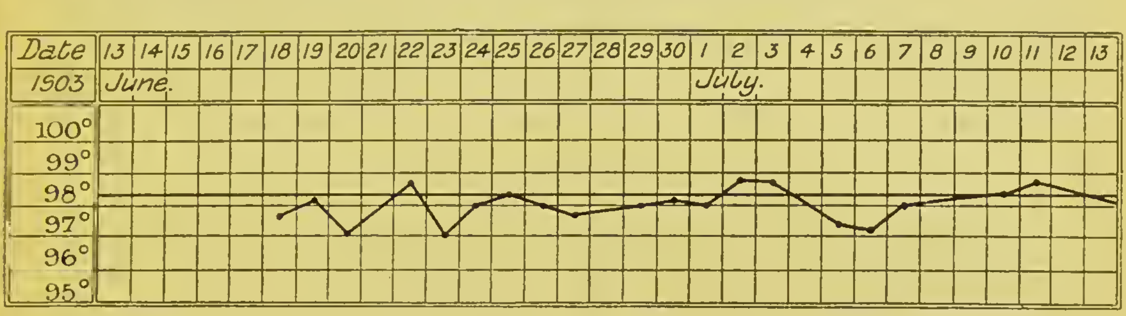
April 24, 1903. Patient states that he has been 6 months in Entebbe. His illness began on March 10. He asserts that at present he feels quite well, and has no headache or other symptom. There are no enlarged glands in the neck, but in the axilla they are as large as peas, and they are also enlarged in the groin. His tongue is moist and furred. His speech is fluent. Pulse 120, fair. His heart sounds are normal.

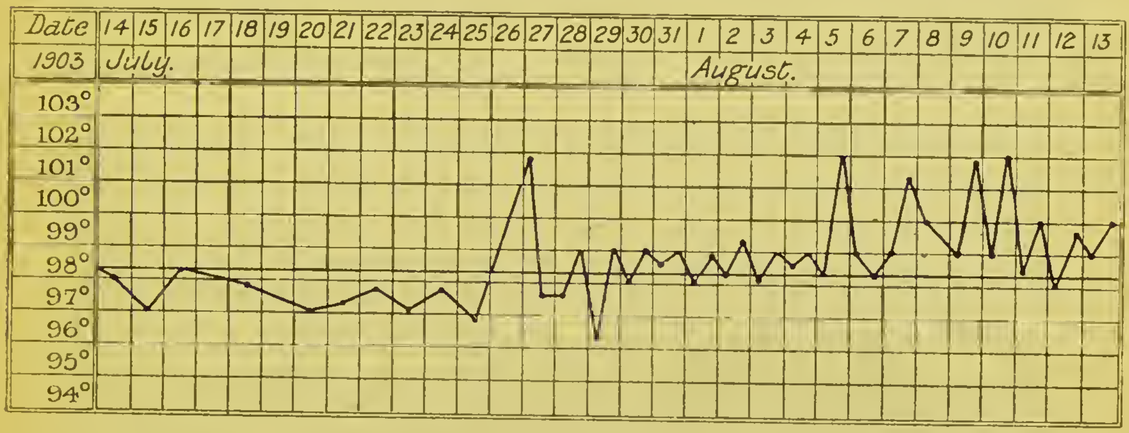
The following chart represents the temperature curve :—






Date
1903
13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12
May.
June.
100°
99°
98°
97°
96°
95°


Date
1903
13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 1 2 3 4 5 6 7 8 9 10 11 12 13
June.
July.
100°
99°
98°
97°
96°
95°


Date
1903
14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13
July.
August.
103°
102°
101°
100°
99°
98°
97°
96°
95°
94°

The following table shows the presence or absence of trypanosomes in the blood and cerebro-spinal fluid :—

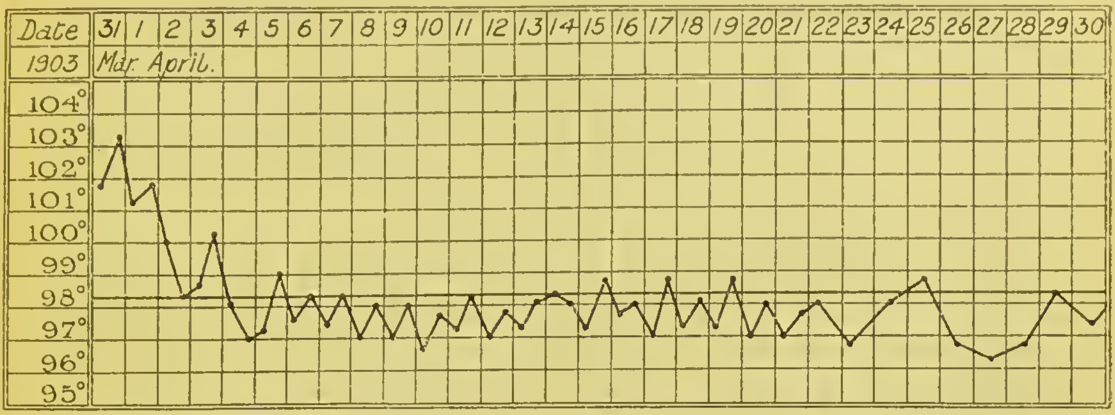
Date.	Parasites in blood.			Parasites in cerebro-spinal fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Mar. 12			+		
,, 13			+		
,, 14			+		
,, 15			+		
,, 27				—	—
Apr. 17				—	—
May 6				—	—
,, 16	+		—		
,, 19			+		
,, 26				—	—
June 24	+		+		+
July 24			+		+

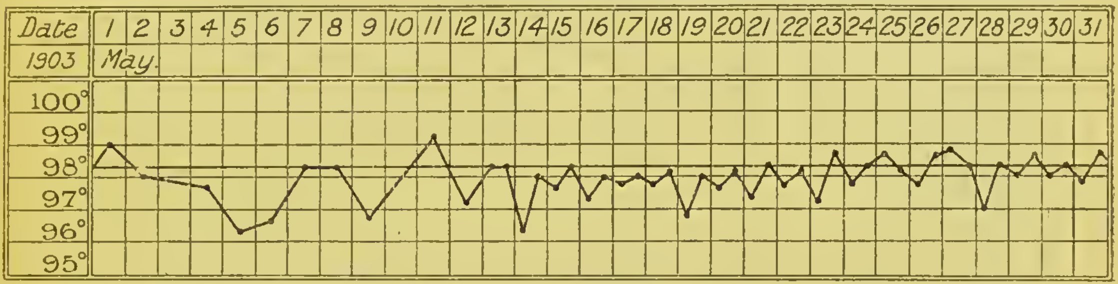
Remarks.—This is an important and suggestive case. Karala Barigi was admitted to hospital on March 12, and his disease was diagnosed trypanosoma fever. After a few days his temperature becomes normal, and he remains apparently in good health, and does his duty as a policeman until the end of July, when his temperature again becomes unsettled, and he is again admitted into hospital. During all this time the trypanosomes have been found in his blood, but it is only towards the end of June that they are found in the cerebro-spinal fluid, and this corresponds fairly well with the rise in temperature. The temperature curve is also very suggestive of Sleeping Sickness, and it is suggested that this case of trypanosoma fever is now passing on to Sleeping Sickness. At the same time it must be admitted that up to the present date he shows no marked symptoms of Sleeping Sickness.

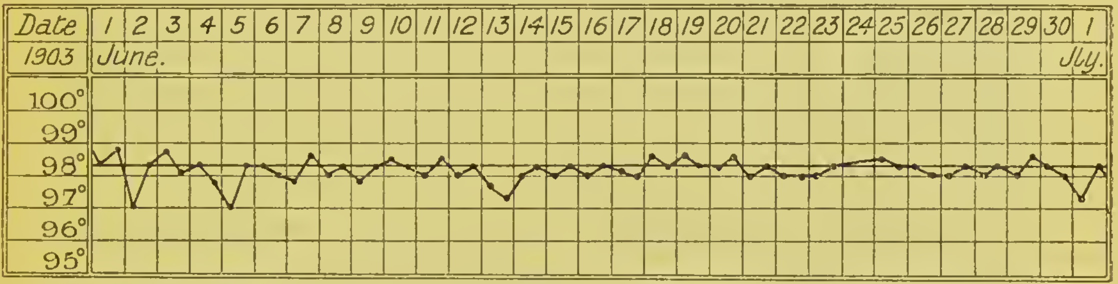
CASE 64.—Jordien Murjan. Male. Age 35 years. District, Muru. Nubian. Occupation, Prisoner, for last 2 Years.

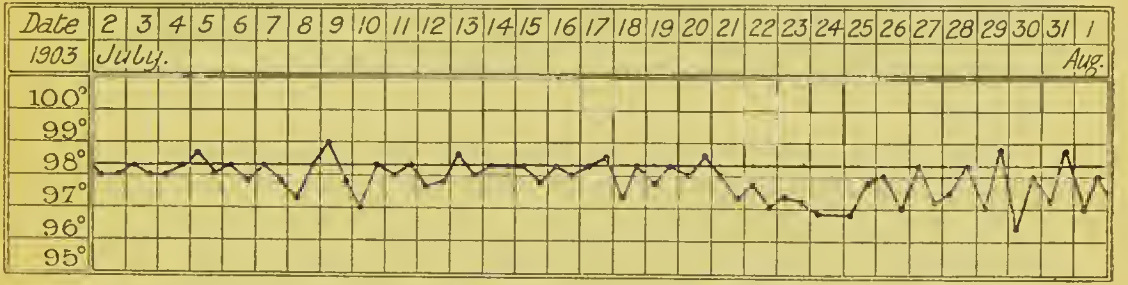
March 31, 1903. Admitted to hospital. He is an old Soudanese mutineer, and lives as a prisoner in the jail. No fellow prisoners have had Sleeping Sickness. He has no œdema, and no noticeable swelling of glands. His tongue is healthy, but shaky. There is no tremor of the hands. His speech is normal, and pulse 144.

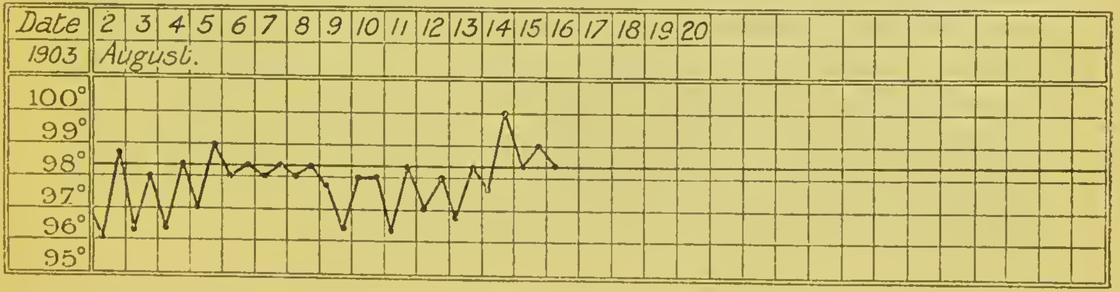
The following chart represents the temperature curve :—


Date
1903
31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Mar. April.
104°
103°
102°
101°
100°
99°
98°
97°
96°
95°


Date
1903
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
May.
100°
99°
98°
97°
96°
95°


Date
1903
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 1
June.
Jly.
100°
99°
98°
97°
96°
95°


Date
1903
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1
July.
Aug.
100°
99°
98°
97°
96°
95°


Date
1903
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
August.
100°
99°
98°
97°
96°
95°

The following table shows the presence or absence of trypanosoma in the blood and cerebro-spinal fluid :—

Date.	Parasites in blood.			Parasites in cerebro-spinal fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Mar. 31			+		−
Apr. 1			+		
,, 2			+		
,, 3			+		
,, 17				−	−
May 1	−	−	+		−
,, 11			+		−
,, 25			+		−
June 9	−		+		−
,, 23	−		+		−
July 22			+		+
Aug. 18					+

Remarks.—Here again we have a case closely resembling that of Karala Barigi. The trypanosomes are constantly found in the blood, although the man appears to be in good health. On July 22 the trypanosomes have found their way into the cerebro-spinal fluid, and it is suggested that this case is also going on to Sleeping Sickness.

In the Progress Report the cases of Kumsarsabba, Tabula, and Bara Risgallah were also given. These men are still under observation, but nothing has happened. The trypanosomes are found regularly in their blood, but never in the cerebro-spinal fluid. Their temperature is constantly normal. The men are at duty, and say they feel strong and well.

From these cases it will be seen that the trypanosomes, when confined to the blood, do not visibly affect the health of their native hosts. The question seems to resolve itself into either the trypanosomes found in the blood, and in the cerebro-spinal fluid belong to different species, and give rise to different diseases, or they are one and the same, and if confined to the blood give rise to slight feverish symptoms, whereas if they gain entrance to the cerebro-spinal fluid they give rise to Sleeping Sickness. The evidence is not strong enough, at present, to justify a dogmatic answer to the question, but what there is points to the trypanosomes being one and the same, and trypanosoma fever the first stage of Sleeping Sickness.

6. *Does the Blood of the General Population contain Trypanosomes?*

On May 18 the Commission received a telegram from the Royal Society, asking for statistics regarding the prevalence of trypanosomes in the general population (*a*) inside, and (*b*) outside the Sleeping Sickness area. On a little consideration the importance of such an inquiry is seen. If the trypanosoma found in the blood of Karala Barigi and the others belongs to the same species as that found in Sleeping Sickness, then a larger percentage of the general population inside the Sleeping Sickness area should be found to harbour trypanosomes, than those living in the Non-Sleeping Sickness area. In fact, if the supposition be true, there ought not to be a single trypanosoma found in the blood of persons living in a clean area. Because, if the theory that trypanosomes in the blood is merely the first stage of Sleeping Sickness be true, then you cannot have all the cases in the Non-Sleeping Sickness area in the initial stage, but scattered among them you would naturally expect to find some in the more advanced stage.

In Entebbe, the hut-tax labourers supply ample material for such an investigation. There are some 1,500 employed here at present, and they come from all parts of the Protectorate. They remain at work in Entebbe for one month, and then return to their homes. During this time they are liable to contract Sleeping Sickness, but for the purpose of this inquiry natives from Non-Sleeping Sickness areas, who had only been a few days in Entebbe, were chosen. Capt. Greig also went over to Nairobi, in British East Africa, and examined 50 cases in an undoubted Non-Sleeping Sickness area.

The results of these examinations are given in the following lists. These lists are given in full, and will be useful six months or a year hence in order to trace out and learn the fate of the men whose blood now show trypanosomes, but who, at present, have no symptoms of Sleeping Sickness.

Incidence of Trypanosomes in the Blood of General Population.

A.—Sleeping Sickness Area.

Date.	Name.	Age.	Sex.	District.	Shamba.	Name of chief.	Trypanosoma.	Filaria.
June 12 ..	Wagononye	25	M.	Sese Island	Sewana	..	+	+
,, 13 ..	Zamala	20	M.	,,	Kaganda Island	..	—	+
	Sibolyamba	25	M.	,,	Semagala Island, Malanga	..	+	+
	Lusaka	30	M.	,,	Kaganda Island, Bubeki	..	—	+
	Byasi	20	M.	,,	Semagala Island, Busendeni	Serumaga	—	+
	Nalyonzi	25	M.	,,	Buvovu Island, Kasange	Nokuba	—	+
	Sagala	25	M.	,,	Kaganda Island, Bukasa	Kaganda	—	+
,, 16 ..	Paulo	20	M.	,,	Semagala Island, Dajs	Bugambi	—	+
	Luwercheti	30	M.	,,	Buvu Island	Namamba	—	+
	Balyokwakwe	35	M.	,,	Semagala Island, Burigo	Kakobogo	—	—
	Kapero	20	M.	,,	Semagala Island, Busowa	Sawadu	—	—
	Kewaza	20	M.	,,	Semagala Island, Bungo	Kakobogo	—	+
	Takirambala	40	M.	,,	Lubamba Island, Impenja	Sabawabe	—	—
	Gumira	40	M.	,,	Bugaba Island	Bugu	+	+
	Kitungula	25	M.	,,	Semagala Island, Buswa	Keozekia	+	—
	Tevamukopi	35	M.	,,	Bunami Island	Buvaro	+	+
	Kajerero	25	M.	,,	Buninga Island	Savawau	—	+
,, 18 ..	Zwaki	23	M.	Kome Island	Kome Island	..	+	+
	Nutaba	24	M.	Bugaba Island	Bugaba Island	..	+	+
	Nmmugula	25	M.	Sewaia Island	Sewaia Island	..	—	—
,, 19 ..	Sibaganga	30	M.	Bussi Island	Bulenge	Mugema	+	—
,, 23 ..	Tangamalala	25	M.	,,	Bussi Island	Rasto	+	+
	Nasajage	30	M.	,,	,,	,,	+	+
	Tabula	10	M.	,,	,,	,,	—	+
	Mundu	25	M.	,,	,,	,,	—	+

,, 27 ..	Mondu	20	M.	,,	,,	Mugema	–	+
	Buza	30	M.	,,	,,	,,	+	+
	Sabakake	20	M.	,,	,,	,,	+	+
	Bagamatuba	30	M.	,,	,,	,,	–	+
	Nangibwa	30	M.	,,	,,	,,	–	+
.. 8 ..	Magwanjemba	40	M.	Kagagara	..	..	+	+
,, 13 ..	Rotate	45	M.	Nkumba	Nkumba	Sebugwa	–	+
	Junguberase	25	M.	,,	,,	,,	–	–
	Mucase	25	M.	,,	,,	,,	+	–
	Sefebedi	40	M.	,,	,,	,,	–	–
	Mundu	30	M.	,,	,,	,,	–	+
	Kikocharwasi	35	M.	,,	,,	,,	–	–
,, 19 ..	Petero	20	M.	Entebbe	Ugonga	..	–	–
	Sibasoboke	30	M.	Bussi Island	Gombe	Mugema	–	+
,, 20 .	Arikisi	40	M.	Magema	Mugema	Sebugwao	–	+
	Antonio	20	M.	,,	,,	,,	–	–
	Kiguaku	30	M.	,,	,,	,,	–	–
	Brahmi	25	M.	,,	,,	,,	–	–
	Musoke	14	M.	,,	,,	,,	–	–
	Daniel	12	M.	,,	,,	Sebanji	–	–
	Balumedeni	20	M.	,,	,,	,,	–	–
	Semone	20	M.	,,	,,	,,	–	+
	Muagazi	30	M.	,,	,,	Mugema	–	+
	Nyasi	12	M.	,,	,,	Sebanja	–	–
.. 22 ..	Saulo	18	M.	,,	,,	Mugema	+	–
	Zake	20	M.	,,	,,	,,	–	+
	Kalulwe	40	M.	Entebbe	Kigungu	Mugula	+	+
	Kakulwana	18	M.	,,	,,	Wasanye	–	+
.. 22 ..	Zirimanye	18	M.	,,	,,	Mugula	–	–
	Danielli	16	M.	,,	,,	Batende	–	–
	Daudi	20	M.	,,	4 miles	Kalunga	–	+
	Bafirawara	16	M.	,,	Zinderi	Mugula	–	–
	Mutesenda	20	M.	,,	3 miles	,,	–	–
	Lugwana	18	M.	,,	Kabale	Sebugwao	–	–
	Gabula	20	M.	,,	..	,,	–	–
March 12 ..	Karala Barigi	..	M.	,,	Policeman	..	+	+

A.—Sleeping Sickness Area—*continued.*

Date.	Name.	Age.	Sex.	District.	Shamba.	Name of chief.	Trypanosoma.	Filaria.
March 28 ..	Kumsarsabba	..	M.	Entebbe	Policeman...............	..	+	–
,, 31 ..	Jordien Murjan.....	..	M.	,, ...	Prisoner	..	+	–
April 15 ..	Tabula	..	M.	,, ...	Marine	..	+	+
,, 21 ..	Bara Risgallah	..	M.	,, ...	Policeman...............	..	+	+
,, 23 ..	Airara............	..	M.	,, ...	Prisoner	..	–	–
	Biggity	..	M.	,, ...	,, ...	..	–	–
,, 24 ..	Nathaniel.........	..	M.	,, ...	Hospital	..	–	–
,, 28 ..	Aradiki...........	..	M.	,, ...	,, ...	..	–	–
,, 29 ..	Chia Msoga	..	M.	,, ...	,, ...	..	–	–
	Arkadi	..	M.	,, ...	,, ...	..	–	–
	Mandandiki	..	M.	,, ...	,, ...	..	–	–
May 6 ..	Jumabini	..	M.	,, ...	,, ...	..	–	–
,, 8 ..	Matea	..	M.	,, ...	,, ...	..	–	–
,, 13 ..	Bifarawala.........	..	M.	,, ...	Prisoner	..	–	–
,, 16 ..	Amuri Abdulla.....	..	M.	,, ...	,, ...	..	–	–
,, 18 ..	Serewame.........	..	M.	,, ...	,, ...	..	–	–
,, 21 ..	Juma Bin Abdulla ..	..	M.	,, ...	,, ...	..	–	–
,, 22 ..	Baraca Bin Salimi ..	..	M.	,, ...	,, ...	..	–	–
April 2 ..	J. M..............	..	M.	,, ...	Hospital	European	+	–

Incidence of Trypanosomes in the Blood of General Population.

B.—Non-Sleeping Sickness Area, Uganda.

Date.	Name.	Age.	Sex.	District.	Shamba.	Name of chief.	Trypanosoma.	Filaria.
June 2	Wagalla	40	M.	Kampala	..	..	—	+
	Zemadari	20	M.	,,	..	..	—	+
	Mutakanya	25	M.	,,	..	..	—	—
	Suziga	20	M.	,,	..	..	—	—
,, 3	Burrigardi	30	M.	Toro	Kaima	..	—	—
	Ntaragi	40	M.	Makota	5 days N. of Kampala	..	—	—
	Bassaga	15	M.	,,	,,	..	—	—
	Kilongazi	50	M.	Jalamba	Near Makota	..	—	+
,, 4	Kianju	40	M.	Buganga	..	..	—	—
	Nsali	40	M.	,,	..	..	—	—
	Jagenda	35	M.	Singo	Matiana	..	—	—
	Sengova	30	M.	Buganga	..	..	—	—
	Kidormori	30	M.	Nakolia	..	..	—	+
	Bagnsagera	25	M.	,,	..	..	—	—
,, 5	Luganda	20	M.	Kalagala	..	..	—	—
	Birlla	35	M.	Matuntotora	..	..	—	+
	Kagema	45	M.	,,	..	..	—	+
	Kasoka	35	M.	Kibali	..	..	—	—
	Bulabiki	40	M.	Kiwangole	..	..	—	—
,, 8	Kongura	35	M.	Kikanda	..	..	—	—
,, 10	Watagana	35	M.	Bulemwezi	Busibika	..	—	—
	Karimuemba	40	M.	Kalagala	Kalagala	..	—	—
	Watesaka	20	M.	Bulemwezi	Sambwao	..	—	+
	Matamburire	35	M.	,,	Busindi	..	—	—
	Roukiaju	30	M.	,,	Sambwao	..	—	+
	Kaisi	40	M.	,,	,,	..	—	+
,, 11	Guatude	25	M.	Mawokota	Kaniki	..	—	—
	Murianzeki	30	M.	,,	,,	..	—	+
	Tandamuwaka	30	M.	,,	,,	..	—	+
	Banegwira	30	M.	,,	,,	..	—	+
	Basaga	30	M.	,,	,,	..	—	+
	Muayowa	35	M.	,,	,,	..	—	+

Non-Sleeping-Sickness Area, Uganda—*continued.*

Date.	Name.	Age.	Sex.	District.	Shamba.	Name of chief.	Trypanosoma.	Filaria.
June 12	Kawaratuli	45	M.	Buddu	Masaka	..	–	+
	Kyalwazi	45	M.	,,	,,	..	–	+
	Byempulidi	40	M.	,,	,,	..	–	–
	Ganantawa	40	M.	..	..	..	–	+
	Sabagwera	25	M.	,,	Dinnu ?	..	–	+
,, 15	Kubolikoza	20	M.	Mawokota	Kaima	Rutalo	–	–
	Semukotu	30	M.	..	Kabire	Muhaia	–	–
	Muogozi	25	M.	..	Kagenda	Kagenda	–	–
	Muinda	30	M.	..	Donda	Muquerwa	–	+
	Bamutarye	15	M.	..	Kaima	Dukadyi	–	+
	Mitickula	25	M.	,,	Keaugo	Kabodyi	–	–
,, 17	Kida	25	M.	Busiro	Luoka	Mukulu	–	+
	Zambatise	25	M.	..	Kiengaza	,,	–	–
	Ibu	25	M.	..	Luoka	,,	–	+
	Zinazi	20	M.	,,	Kisiba	Kasola	–	–
	Takaridia	20	M.	Singo	Bujonkola	Kajongolo	–	–
	Malugyo	20	M.	,,	Ksagembi	Mbugano	–	–
	Bafirawala	20	M.	,,	Kalungu	Mutesa	–	–
	Buzibwa	20	M.	Busiro	Kireha	Kikwabanga	–	–
	Nume	35	M.	Singo	Kagembe	Mukwenda	–	+
,, 18	Kirimentao	40	M.	Unyoro	Buianja	Kimbaranga	–	–
	Tamanya	40	M.	..	..	,,	–	–
	Makogoto	40	M.	..	Kikumbia	,,	–	–
	Sabagabu	25	M.	..	Seresi	Museresi	–	–
	Lukala	25	M.	..	Pachwa	Kimbaranga	–	–
	Kowemi	25	M.	..	Bubangu	Kasoro	–	–
	Kahirebu	35	M.	..	Buianja	Kimbaranga	–	–
	Rukubywa	40	M.	..	Pachwa	,,	–	–
	Kicka	20	M.	..	,,	Peteri	–	–
	Murumbia	30	M.	..	..	,,	–	+
,, 19	Zezefu	25	M.	Bulemwezi	Kaswa	Kasiba	–	–
	Katagu	18	M.	Buddu	Kagandu	Kakembo	–	–
	Mukasa	14	M.	Busiro	Maganja	Mudnauliba	–	–
	Name unknown	20	M.	(?)	(?)	Bruei	–	–

Incidence of Trypanosomes in the Blood of General Population.

C.—Non-Sleeping Sickness Area, Nairobi, British East Africa.

(Examined by Capt. Greig, I.M.S., and Dr. Wiggins.)

Date.	Name.	Occupation.	District.	Trypanosoma.	Filaria.
July 14	Sinandi	Askaris	Masai	—	—
	Gila	,,	,,	—	—
	Massina	,,	,,	—	—
	Barugo	,,	,,	—	—
	Matolo	,,	,,	—	—
,, 15	Nandi	,,	,,	—	—
,, 15	Tomana	,,	,,	—	—
	Rosani	,,	,,	—	—
	Rosi	,,	,,	—	—
	Lendiana	,,	,,	—	—
	Gingili	,,	,,	—	—
,, 16	Rangue	,,	,,	—	—
	Kabode	,,	,,	—	—
	Kamia	,,	,,	—	—
	Tabangi	,,	,,	—	—
,, 17	Karmongi	Labourer	Kukuyu	—	—
	Yurimgo	,,	,,	—	—
	Girewamatwo	,,	,,	—	—
	Katono	,,	,,	—	—
	Gomi	,,	,,	—	—
	Kayaro	,,	,,	—	—
,, 18	Ati	Prisoner	,,	—	—
,, 20	Gmosi	,,	,,	—	—
	Luwi	,,	,,	—	—
	?	,,	Masai	—	—
	Nana	,,	,,	—	—
	Seri	,,	,,	—	—
	Goma	,,	,,	—	—
,, 20	Kinare	,,	,,	—	—
	Mahone	,,	Kukuyu	—	—
,, 21	Masagai	,,	Masai	—	—
	Desa	,,	,,	—	—
	Muenda	,,	,,	—	—
	Morandat	,,	,,	—	—
	Joke	,,	Wakamba	—	—
	Waweme	,,	Masai	—	—
	Zabe	,,	Wakamba	—	—
	Kalango	,,	Kukuyu	—	—
	Harya	,,	,,	—	—
,, 22	Nabo	Askaris	Masai	—	—
	Legina	,,	,,	—	—
	Kisikas	,,	,,	—	—
	Mandasingere	,,	,,	—	—
	Magome	,,	,,	—	—
	Lougotoematabut	,,	,,	—	—
	Gomi	,,	,,	—	—
	Lulgini	,,	,,	—	—
	Zeru	Labourer	Kukuyu	—	—
	Jarogo	,,	,,	—	—
	Kauosi	,,	,,	—	—

Eighty natives from the Sleeping Sickness area were examined, with the result that 23 were found to have trypanosomes in their blood, giving a percentage of 28·7.

One hundred and seventeen were examined from Non-Sleeping Sickness areas, but not a single trypanosoma was found.

We submit that these results suggest that the trypanosomes found in the blood of seemingly healthy persons, and in the cerebro-spinal fluid of Sleeping Sickness cases are identical, and further, that these trypanosomes are in truth the cause of the disease.

7. *No Difference can be made out Microscopically between the Trypanosoma of Sleeping Sickness and that of Trypanosoma Fever.*

In the Progress Report it was stated that it would appear that the trypanosomes found in Sleeping Sickness are shorter, have chromatic dots more frequently, and the micro-nucleus is situated nearer the end than in the other.

Since the above was written, an observation has been made, which would seem to do away with any significance the above differences in size and shape may seem to have. It is that trypanosomes from the cerebro-spinal fluid injected into the blood of monkeys become quite as long as the trypanosomes found in the blood of man, and the other differences also disappear. This would go to show that the trypanosomes merely find the cerebro-spinal fluid not as favourable for their growth as the blood, and on this account are stunted.

8. *Are these Trypanosomes pathogenic to Animals and can any Specific Difference be made out between them by Animal Experiment?*

The only notice we have seen of the result of the inoculation of animals with the West African *Trypanosoma Gambiense* (Dutton), is that recorded by Annett in the "British Medical Journal," February 7, 1903.

He states "the disease is very chronic in white rats; some appear to be refractory, others died in two or three months. Similarly also in monkeys the infection only proves fatal in about 2 months. Dogs seem to be entirely refractory."

In the following account of the inoculation of various animals with trypanosomes from the cerebro-spinal fluid of Sleeping Sickness cases and from the blood of persons showing no symptoms of Sleeping Sickness we shall not apologise for giving temperature charts and entering into details. In a new and little-known disease descriptions of experiments should be given with as much detail as possible.

The animals available here for inoculation are monkeys, dogs, guinea-pigs, rats, donkeys, oxen, sheep and goats. No animal has been found which shows any marked susceptibility to this disease, or in which the disease runs a rapid acute course, as is the case in Nagana.

The monkeys are the most useful, and they have been injected subcutaneously, into the vertebral canal, and through the foramen magnum into the brain cavity, with cerebro-spinal fluid and blood from many sources.

A.—*Experiments on the Effect on Monkeys of the Injection of Cerebro-Spinal Fluid containing Trypanosomes taken by Lumbar Puncture from Cases of Sleeping Sickness.*

EXPERIMENT 1.—Monkey, Male, Pale-faced variety (*Macacus rhesus*).

To note the effect of the subcutaneous injection of cerebro-spinal fluid containing trypanosomes, from a case of Sleeping Sickness.

March 23, 1903. Injected 10 c.c. of cerebro-spinal fluid taken *post-mortem* from Case 18, Kaperi, under the skin of the left side of the monkey.

May 11. As the injection of cerebro-spinal fluid on March 23 has not given positive results, this monkey was again injected under the skin with 2 c.c. of cerebro-spinal fluid from Case 41, Warosansa.

May 28. Trypanosomes were found in the blood for the first time. This is evidently due to the second injection 17 days ago.

June 3. This monkey has been ill during the last week and has gradually been growing thinner and weaker. This afternoon he had a convulsive seizure, which affects the right side more than the left, he has clonic spasms of the right arm and leg with twitching of the face and eyes.

June 4. The trypanosomes are numerous in the blood. His condition has considerably improved. There is no sign of paralysis. The right knee jerk is diminished. He is able to climb into his box.

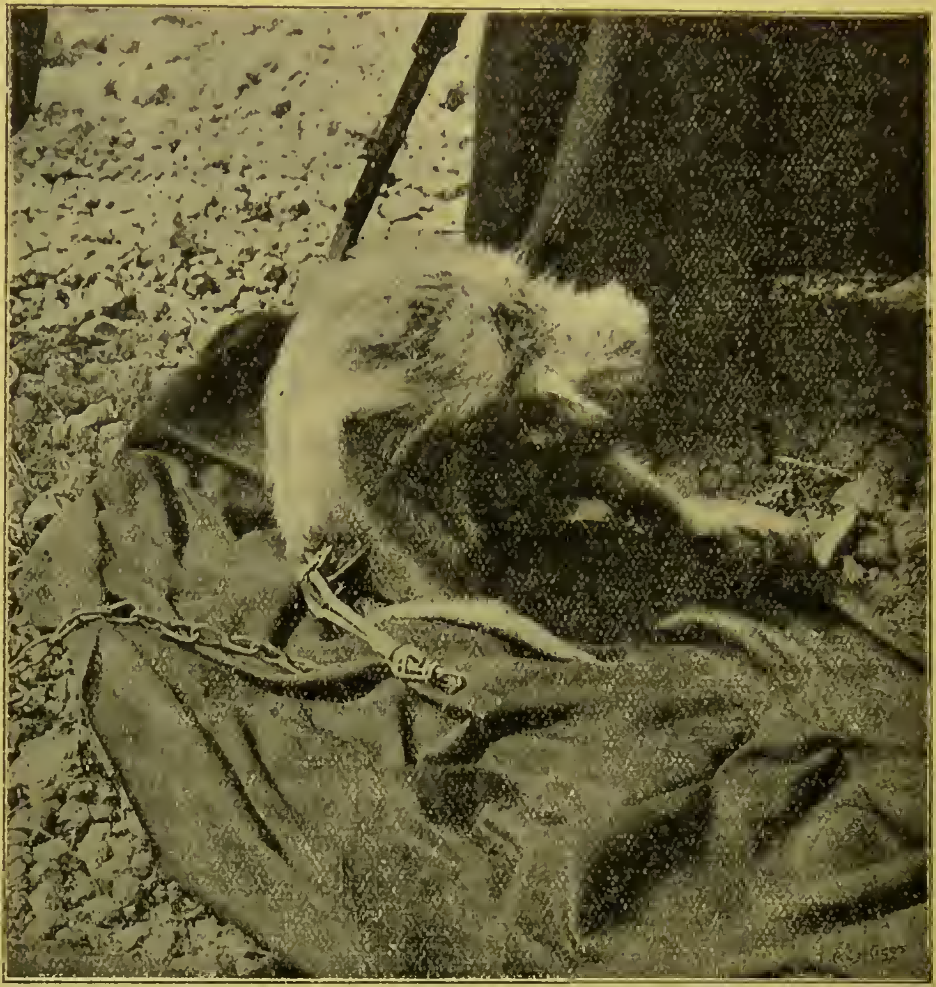
June 5. He is quite lively to-day.

June 11. The trypanosomes are still more numerous.

June 18. The trypanosomes are scanty.

June 23. During the last 10 days this monkey has shown symptoms of Sleeping Sickness. He sits all day long with his head sunk on his chest evidently asleep.

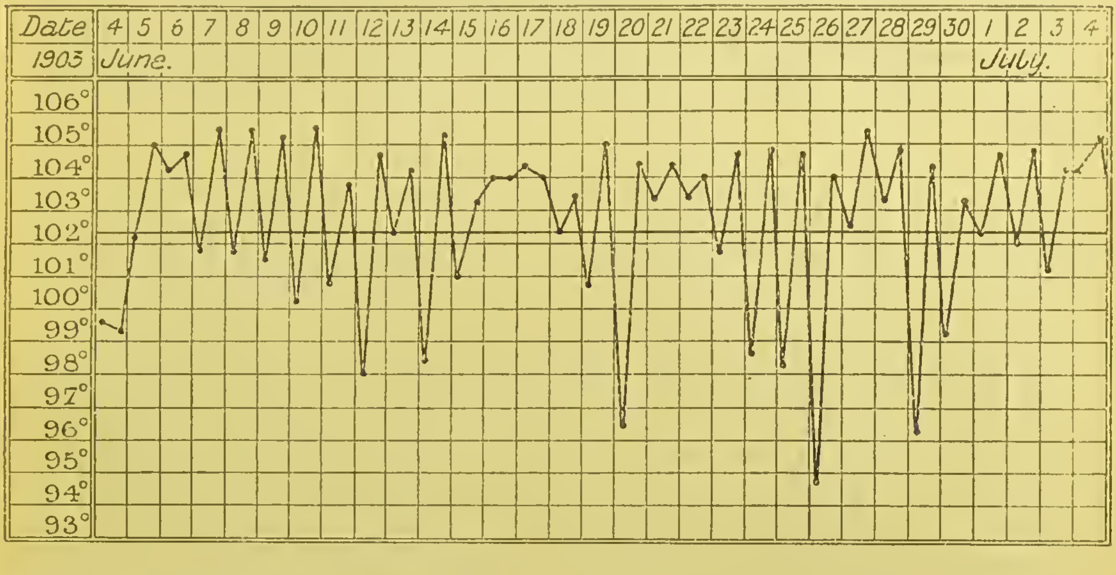
The following photograph shows his appearance at this time:—

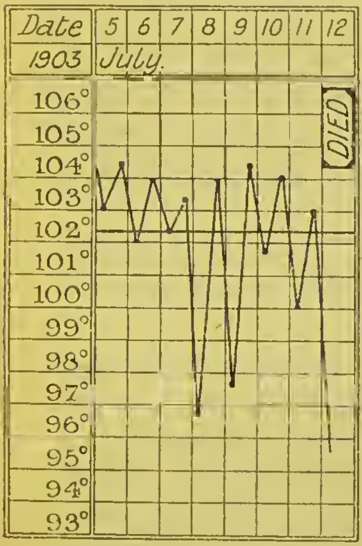


July 10. Since the last entry the appearance of Sleeping Sickness has become more marked. The animal sits still all day with eyes closed and head sunk on chest. He is extremely emaciated but has no marked signs of paresis. He can still climb into his box. As he sits in this lethargic condition the muscles of the arms and trunk frequently show marked twitching, a symptom often seen in the last stages of Sleeping Sickness.

July 12. Died at 11.30 A.M.

The following chart represents the temperature curve from June 4 to July 12. From March 24 to May 23 the temperature remained absolutely normal. No observations were made from May 24 to June 3.





The following table shows the presence or absence of trypanosoma in the blood:—

Date.	Parasites in blood.		
	Filaria.	Malaria.	Trypanosoma.
1903.			
Apr. 7		–	–
,, 8		+	–
,, 9		–	–
,, 11		–	–
,, 14			–
,, 22	–	–	–
,, 30	–	–	–
May 7			–
,, 14		–	–
,, 21		–	–
,, 28		–	+
June 4		–	+
,, 11		–	+
,, 18		–	+
,, 25		–	+
July 1		–	+
,, 10		–	+

Post-mortem immediately after death.

The body is extremely emaciated. There is an ulcer in the right groin about the size of a shilling. The inguinal and axillary glands are enlarged. The mucous membranes are pale. The right pupil is dilated, the left is normal.

On opening the body the omentum is seen to be studded thickly with hard tubercular nodules, and the surface of the liver and lungs are also seen to be tubercular.

On removing the calvarium, the dura mater is found to be healthy. On the surface of the left cerebral hemisphere there is seen a caseous mass about the size of a bean which is adherent to the dura mater and evidently tuberculous in origin. The surface of the brain is pale in colour and the vessels are only slightly injected. Unfortunately, owing to an accident, the brain was not preserved for more minute examination.

Microscopical examination of blood from the heart showed numerous trypanosomes.

Remarks.—During life this animal presented the appearance of a typical Sleeping Sickness case. Even when in the act of eating, his eyes would close, his head fall forward on his chest, and he would sit apparently sound asleep. It was disappointing to find on *post-mortem* examination that the animal was tubercular.

It is to be regretted that the brain was not preserved, also that no examination of cerebro-spinal fluid was made for trypanosomes. Nevertheless, when this case is placed beside Experiment 60 (p. 55),* and the two are compared, it will be agreed that this monkey owed its symptoms to the trypanosomes and not to the tubercle.

This pale-faced variety was brought by us from England and none of them harbour malarial parasites as most of the local black-faced variety do. They seem to be more susceptible to the trypanosomes than the local species.

EXPERIMENT 34.—Monkey (Male) (*Macacus rhesus*).

To note the effect of injecting the cerebro-spinal fluid from a case of Sleeping Sickness into the vertebral canal of a monkey.

April 8, 1903. Injected 1 c.c. of cerebro-spinal fluid containing trypanosomes from a case of Sleeping Sickness into the spinal canal of this monkey.

April 30. Trypanosomes appeared in the blood to-day, 19 days after inoculation into the spinal canal. Note that the temperature curve shows no sign of this invasion.

May 21. Trypanosomes numerous in the blood. Temperature taken and found to be 106°·4 F.

Aug. 25. This monkey is beginning to show the usual symptoms of the disease in the monkey. He sits most of the day with his head fallen on his chest, evidently asleep, and his temperature has become very irregular.

The following chart represents the temperature curve :—

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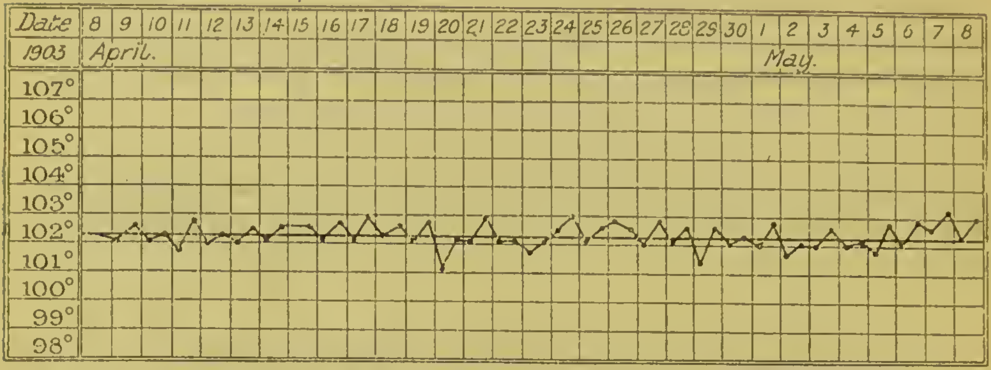
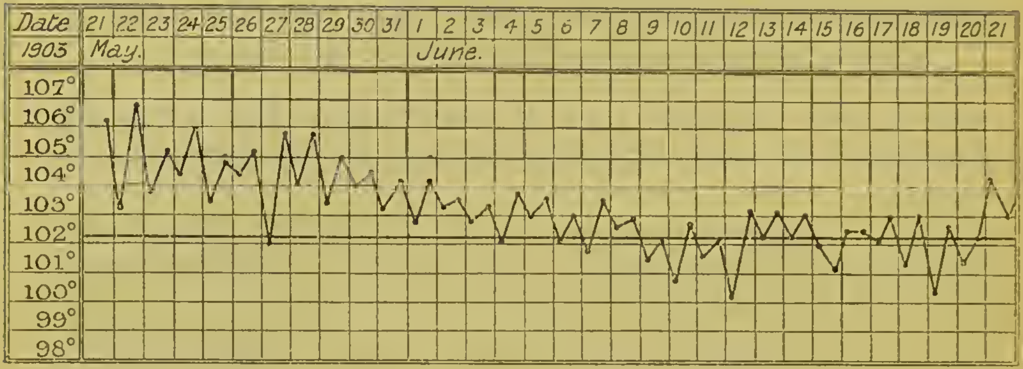
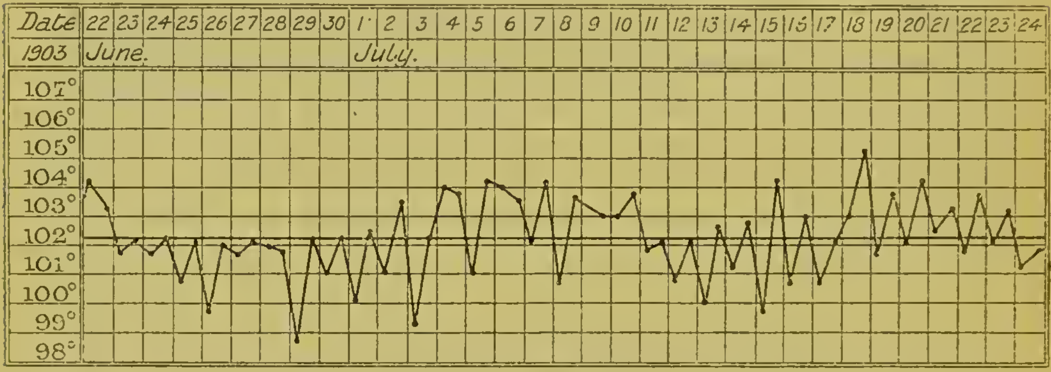
* See Progress Report.


Date
8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 1 2 3 4 5 6 7 8
1903
April.
May.
107°
106°
105°
104°
103°
102°
101°
100°
99°
98°


Date
21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
1903
May.
June.
107°
106°
105°
104°
103°
102°
101°
100°
99°
98°


Date
22 23 24 25 26 27 28 29 30 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
1903
June.
July.
107°
106°
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104°
103°
102°
101°
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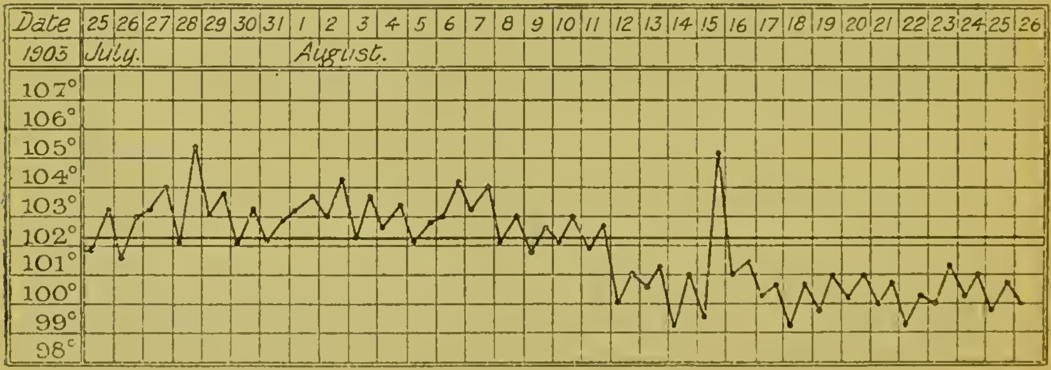
99°
98°


Date
25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
1903
July.
August.
107°
106°
105°
104°
103°
102°
101°
100°
99°
98°

The following table shows the presence or absence of trypanosomes in the blood:—

Date.	Parasites in blood.		
	Filaria.	Malaria.	Trypanosoma.
1903.			
Apr. 11	—	—	—
" 24	—	—	—
" 30	—	—	+
May 7		—	+
" 14		—	+
" 21		—	+
" 27		—	+
June 4		—	+
" 11		—	+
" 18		—	+
" 25		—	+
July 1		—	+
" 23		—	+
" 31		—	+
Aug. 13		—	+
" 20		—	+

Remarks.—Four months after inoculation this monkey begins to show symptoms of Sleeping Sickness. It is to be regretted that it was considered impossible to draw off and examine the cerebro-spinal fluid of the monkey on account of the small size of these animals. With care and practice probably it could be done.*

EXPERIMENT 95.—Monkey, black-faced variety (*Cercopithecus* sp.).

To note the effect of injecting the cerebro-spinal fluid from a case of Sleeping Sickness into the vertebral canal of a monkey.

May 13, 1903. Blood examined; there were no malarial parasites or trypanosomes present.

May 14. Injected 1 c.c. of cerebro-spinal fluid from a case of Sleeping Sickness into the vertebral canal of this monkey.

The following table shows the presence or absence of trypanosomes in the blood:—

---

* Captain Greig writes on September 10 that No. 34 has died. "*Post-mortem* was pretty typical of an ordinary Sleeping Sickness case. Trypanosomes were found living in cerebro-spinal fluid of brain."

Date.	Parasites in blood.		
	Filaria.	Malaria.	Trypanosoma.
1903.			
May 22..........		—	—
,, 29..........		—	—
June 4*		—	+
,, 11.		—	—
,, 20..........		—	+
,, 25..........		—	+
July 1..........		—	+
,, 23..........		—	—
,, 31..........		—	+
Aug. 13..........		—	+
,, 21..........		—	+

Remarks.—Up to the end of August this animal has shown no symptoms of Sleeping Sickness.

EXPERIMENT 96.—Monkey (*Cercopithecus* sp.).

To note the effect of injecting the cerebro-spinal fluid from a case of Sleeping Sickness into the vertebral canal of a monkey

May 14, 1903. Blood examined. No malaria or trypanosoma.

Injected 1 c.c. of cerebro-spinal fluid from a case of Sleeping Sickness into the vertebral canal of this monkey.

August 25. No symptoms. No rise of temperature.

The following table shows the presence or absence of trypanosomes in the blood :—

Date.	Parasites in blood.		
	Filaria.	Malaria.	Trypanosoma.
1903.			
May 22..........		+	—
,, 29..........		+	—
June 4..........		+	—
,, 11..........		+	—
,, 20..........		+	—

June 24. Again injected 1 c.c. of cerebro-spinal fluid from a case of Sleeping Sickness into the spinal canal of this monkey.

---

* Twenty-one days after inoculation.

Date.	Parasites in blood.		
	Filaria.	Malaria.	Trypanosoma.
1903.			
July 1		+	−
,, 23		+	−
,, 31		+	+
Aug. 13		+	+
,, 21		+	+

EXPERIMENT 54.—Monkey (*Cercopithecus* sp.).

To note effect of injection of cerebro-spinal fluid containing trypanosomes from a case of Sleeping Sickness into brain cavity of a monkey.

April 9, 1903. Blood examined. No trypanosoma or malaria.

Injected 1 c.c. of cerebro-spinal fluid from a case of Sleeping Sickness into the brain of this monkey through the foramen magnum.

August 25. No symptoms up to present date. The temperature has remained normal throughout.

The following table shows the presence or absence of trypanosomes in the blood :—

Date.	Parasites in blood.		
	Filaria.	Malaria.	Trypanosoma.
1903.			
Apr. 11		−	−
,, 23	−	−	−
,, 30	−	−	+
May 7		−	+
,, 14		−	+
,, 21		−	+
,, 28		−	+
June 4		−	+
,, 11		−	+
,, 18		−	+
,, 25		+	+
July 1		−	+
,, 23		−	+
,, 31		−	+
Aug. 13		−	−
,, 20		−	+

B.—*Experiments on the Effect of the Injection into Monkeys of Blood containing Trypanosomes from Cases showing no Symptoms of Sleeping Sickness.*

EXPERIMENT 60.—Monkey (*Macacus rhesus*).

To note the effect of the subcutaneous injection of blood from a case of trypanosoma fever.

April 15. Injected subcutaneously 2 c.c. of blood containing trypanosomes from Case 66, Tabula, Marine.

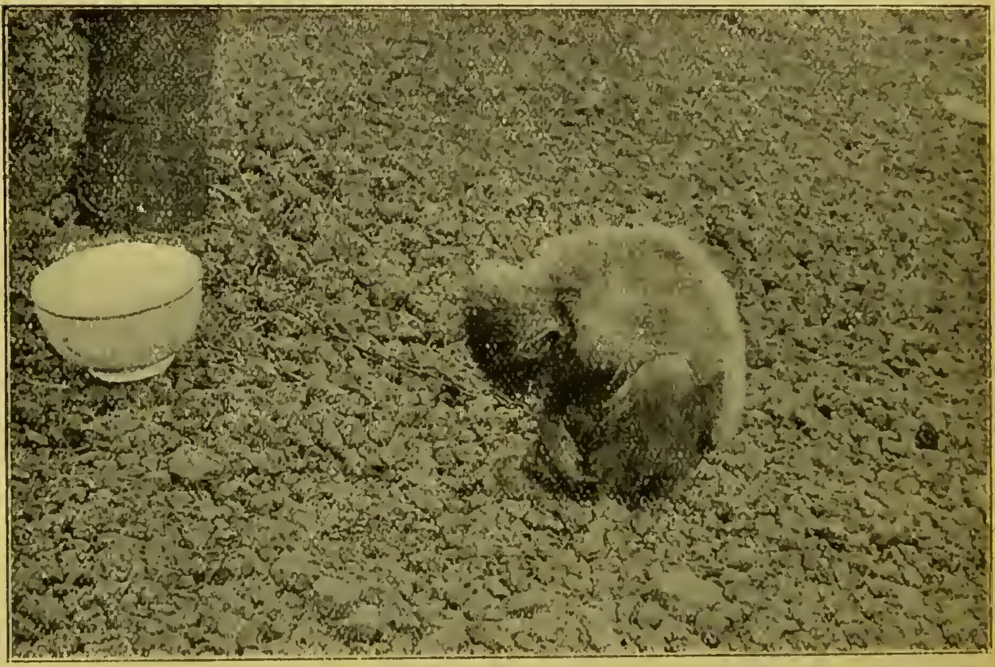
May 7. Trypanosomes appeared in the blood for the first time, 22 days after injection.

May 14. The hæmatozoa are noted as being very numerous.

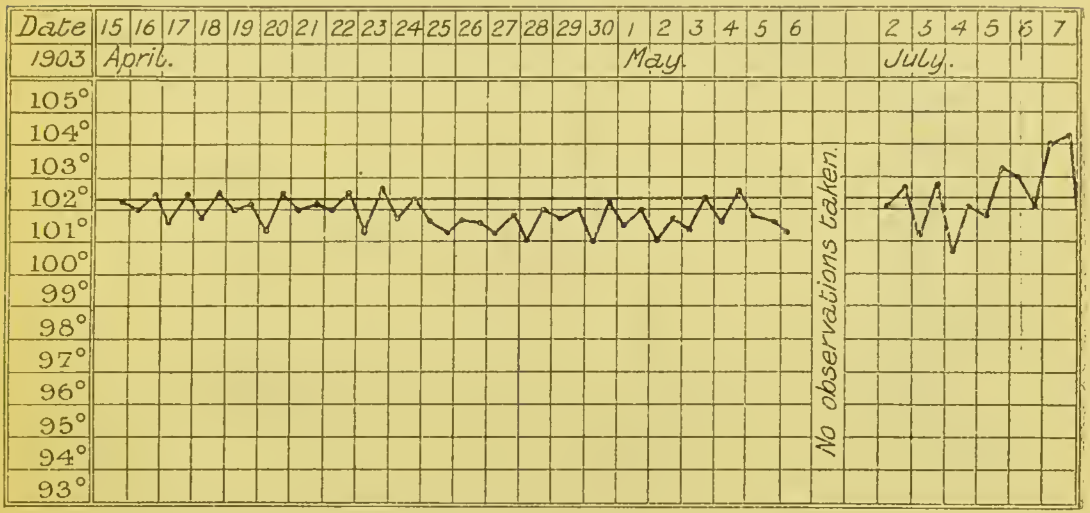
July 2. Up to the present this monkey has shown no signs of being ill. To-day, however, he appears listless and less energetic. Temperature observations resumed.

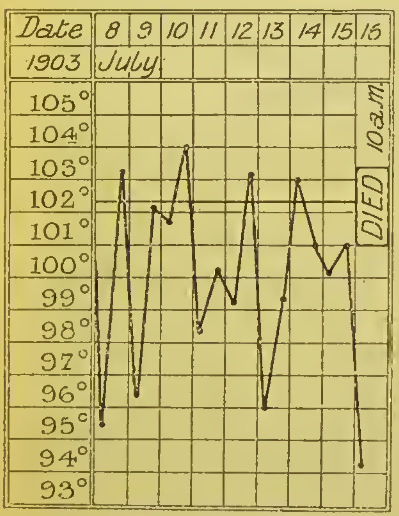
July 15. For the last fortnight this monkey has presented the same picture of Sleeping Sickness as noted in the case of Experiment 1, monkey. He sits about all day with his head sunk on his chest, evidently asleep. He has become emaciated and to some extent puffy and cyanosed about the face.

The following photograph shows his appearance at this time :—



The following chart represents the temperature curve. From April 15 to May 6 the temperature remained normal. No observations were made from May 6 to July 2, when observations were resumed.





The following table shows the presence or absence of trypanosomes in the blood and cerebro-spinal fluid:—

Date.	Parasites in blood.			Parasites in cerebro-spinal fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Apr. 15....		—			
,, 23....	—	—	—		
,, 30....	—	—	—		
May 7....		—	+		
,, 14....		—	+		
,, 21....		—	+		
,, 28....		—	+		
June 4....		—	+		
,, 11....		—	+		
,, 20....		—	+		
,, 25....		—	+		
July 1....		—	+		
,, 16....		—	+		+

July 16. Died at 10 A.M. *Post-mortem* immediately after death.

The body is much emaciated. The pupils are equal and normal. The axillary, inguinal and lymphatic glands are enlarged.

On opening the body there is no fluid found in the peritoneal, pericardial or pleural cavities. There are no signs of tubercle in the mesentery, spleen, liver or lungs.

On removing the calvarium, the dura mater is found to be normal. On reflecting this membrane the surface of the brain presents a striking resemblance to that found in man in cases of Sleeping Sickness. The convolutions are flattened; there is some injection of the superficial vessels; the sub-arachnoid fluid is in excess, filling up the sulci and giving them the ground-glass appearance so often described in cases of Sleeping Sickness. Fluid taken from the lateral ventricle and examined microscopically shows trypanosomes. The brain was removed entire and preserved for future minute examination.

The *heart* is normal in appearance. Blood taken from it and examined microscopically shows many living trypanosomes, many of which present peculiar forms rarely met with. Several of these are represented in the coloured plate.

The *lungs* show no signs of tuberculosis. They are somewhat congested, otherwise normal.

The *liver* is congested and presents a nutmeg appearance.

The *spleen* is large, dark in colour and firm in consistence.

The *kidneys* are normal. The *intestines* appear healthy and present nothing noteworthy macroscopically.

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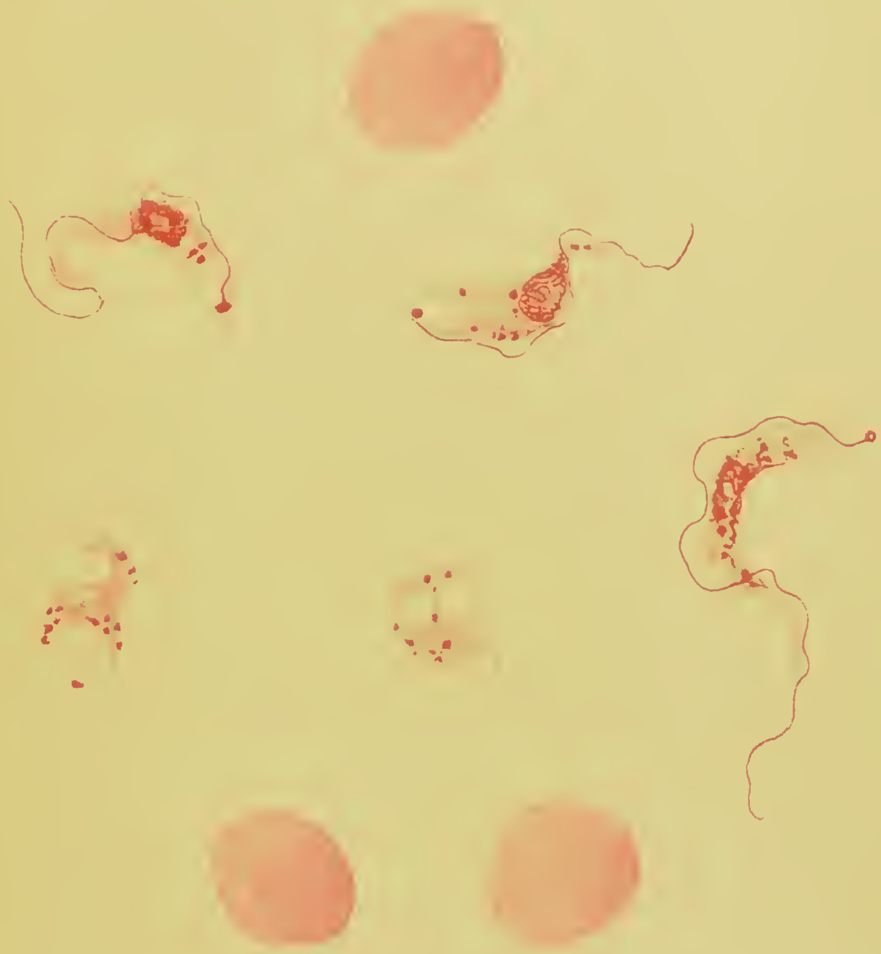

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Remarks.—This is a noteworthy case and should be compared with monkey, Experiment 1 (p. 36).* As far as one could judge, this animal presented the typical appearance of Sleeping Sickness during life, and the brain after death looked like the usual Sleeping Sickness brain in miniature. The organs showed no disease, so that one is bound to look upon the injected trypanosomes as the cause of death.

But the trypanosomes which were injected subcutaneously into this monkey were taken from the blood of a case of trypanosoma fever, from Case 66, Tabula, who, up to the present (August), has shown no signs of Sleeping Sickness. The trypanosomes, although injected subcutaneously, have found their way into the cerebro-spinal fluid and given rise to symptoms which closely resemble Sleeping Sickness in man.

This result is certainly suggestive, and, in our opinion, goes far to prove that we are dealing with one species of trypanosoma, and that Tabula and the others are in the incipient stage of Sleeping Sickness.

EXPERIMENT 56. Monkey (*Cercopithecus* sp.).

To note effect of the injection into the vertebral canal of blood containing trypanosomes from Case 66, Tabula, Marine.

April 14, 1903. Examined the blood of this monkey to-day, and found malarial parasites but no trypanosomes.

April 28. Injected by lumbar puncture 2 c.c. of blood from Case 66, Tabula, Marine, containing trypanosomes, into spinal canal.

May 7. Trypanosomes found in the peripheral blood.

No temperature chart was kept in this case.

The following table shows the presence or absence of trypanosoma in the blood and cerebro-spinal fluid :—

Date.	Parasites in blood.			Parasites in cerebro-spinal fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Apr. 14....		+	–		
May 7....		+	+		
,, 14....		+	–		
,, 21....		+	–		
,, 30....		+	+		
June 4....		+	+		
,, 11....		+	+		
,, 20....		+	+		
,, 25....		+	+		
July 1....		+	+		
,, 10....					+

---

* See Progress Report.

July 1. This monkey is slowly becoming more and more emaciated. He eats his food well and has no very marked symptoms of Sleeping Sickness.

July 10. Died at 1 P.M. *Post-mortem* immediately after death.

The body is emaciated. No external sores. Pupils equal and normal. No signs of tuberculosis. The axillary, inguinal, and femoral glands are slightly enlarged. The heart, lungs, liver, spleen, kidneys, and intestines appear fairly normal to the naked eye.

On making a microscopical examination of the cerebro-spinal fluid from the lateral ventricle, living trypanosomes are found in some numbers. The brain presented nothing abnormal to the naked eye and was preserved for minute examination.

Remarks.—Nothing can be positively asserted about this case. It is true that the *post mortem* appearances showed no other cause of death, but during life there were certainly no marked symptoms of Sleeping Sickness, as in Experiments 1 and 60, though it was noted that during the last few weeks of life, he became disinclined to move. Instead of coming to the end of his chain to receive his food, he sat still and waited till it was put into his hand. It may be noted that the trypanosomes appeared in the blood nine days after injection of blood into the spinal canal, and also that living trypanosomes were found in the lateral ventricles after death. Death occurred 71 days after the inoculation, and in our opinion is probably due to the trypanosomes. It is to be regretted that no temperature chart was kept in this case.

EXPERIMENT 61. Monkey (*Macacus rhesus*).

To note the effect of the injection into the vertebral canal of blood containing trypanosomes from Case 66, Tabula, Marine.

April 28, 1903. Blood examined. No trypanosomes or malaria.

Injected 2 c.c. of blood from Case 66, Tabula, Marine, containing trypanosomes, into the spinal canal of this monkey.

August 25. No symptoms.

The following table shows the presence or absence of trypanosoma in the blood:—

Date.	Parasites in blood.		
	Filaria.	Malaria.	Trypanosoma.
1903.			
Apr. 15..........		—	—
May 7..........		—	+
,, 14..........		—	+
,, 21..........		—	+
,, 28..........		—	+
June 4..........		—	+
,, 11..........		—	+
,, 18..........		—	+
,, 25..........		—	—
July 1..........		—	+
,, 23..........		—	—
,, 31..........		—	—
Aug. 13..........		—	—
,, 20..........		—	—

Remarks.—It is curious that no trypanosomes have been seen in the blood during the last month.

EXPERIMENT 121. Monkey (*Cercopithecus* sp.).

To note effect of injection of blood containing trypanosomes from Case 66, Tabula, into brain of a monkey through foramen magnum.

June 20, 1903. Blood examined. No trypanosoma. Malaria present.

Injected 1 c.c. of blood from Tabula, Marine, into the brain of this monkey.

The following table shows the presence or absence of trypanosoma and malaria in the blood:—

Date.	Parasites in blood.		
	Filaria.	Malaria.	Trypanosoma.
1903.			
May 30		+	—
June 4		+	—
,, 11		+	+
,, 20		+	+
,, 25		+	+
July 1		+	+
,, 23		+	+
,, 31		+	+
Aug. 13		+	+
,, 20		+	+

EXPERIMENT 123. Monkey (*Cercopithecus* sp.).

To note effect of injection of blood containing trypanosomes from Case 64, Jordien Murjan, into brain of monkey through foramen magnum.

May 25, 1903. Examined blood. No trypanosoma present.

Injected 1 c.c. of blood from Case 64, Jordien Murjan, into the brain of this monkey.

The following table shows the presence or absence of trypanosoma and malaria in the blood:—

Date.	Parasites in blood.		
	Filaria.	Malaria.	Trypanosoma.
1903.			
May 28		+	—
June 4		+	—
,, 11		+	+
,, 20		+	+
July 1		+	+
,, 23		+	+
,, 31		+	+
Aug. 13		—	+
,, 21		+	+

These experiments show that the trypanosomes derived from the cerebro-spinal fluid of cases of Sleeping Sickness, and the trypanosomes derived from the blood of persons showing no symptoms of Sleeping Sickness can both give rise to a chronic and fatal disease in the monkey which bears a striking resemblance in its last stages to Sleeping Sickness in man.

These experiments therefore also tend to strengthen the evidence that the trypanosomes derived from these two sources are identical, and that trypanosoma fever and Sleeping Sickness are stages of the same disease.

It may be noted here that several of the monkeys whose cases were given in the Progress Report are still under observation. The trypanosomes are still found regularly in their blood, but nothing further noteworthy has happened, so that they are not alluded to in this report.

Experiments on the Effect of the Injection of these Trypanosomes into Dogs.

The native dog in Uganda is not very suitable as an experimental animal. Many of them die of ankylostomiasis before the experiment is finished, and this disease is so common among them that it is difficult to obtain one free from it. The conclusion arrived at from a study of the few cases under observation is that the trypanosomes of Sleeping Sickness and trypanosoma fever can live and multiply for some time in the blood of the dog, but tend to disappear sooner or later, and that they show no difference in their action on the dog.

Further, it would seem that the pup is less susceptible than the adult, just as the calf is less susceptible to piroplasma than grown-up cattle.

A. *The Injection of Cerebro-Spinal Fluid from Cases of Sleeping Sickness into Dogs.*

This disappearance of the trypanosomes from the blood of the dog is interesting, and makes it a connecting link between the susceptible monkey and the refractory goat, etc.

It is quite possible that there is a certain percentage of men absolutely refractory to the disease, another percentage in which the parasite does not get beyond the blood and is there killed off (*vide* Tabula, Monkey 61) leaving the man immune, and lastly a percentage in which the trypanosomes gain access to the cerebro-spinal fluid, and the symptoms of Sleeping Sickness and a fatal termination supervene.

EXPERIMENT 85.—Dog. Black and White.

To note effect of subcutaneous injection of cerebro-spinal fluid containing trypanosomes from a case of Sleeping Sickness into a dog.

May 5, 1903. Injected 10 c.c. of cerebro-spinal fluid containing trypanosomes from a case of Sleeping Sickness into this dog.

August 18. Dog died. Ankylostomiasis.

The following table shows the presence or absence of trypanosoma in the blood :—

Date.	Parasites in blood.		
	Filaria immitis.	Malaria.	Trypanosoma.
1903.			
May 12			—
,, 19			—
,, 26			—
June 2	+		—
,, 9			+
,, 16			—
,, 24			—
,, 30			—
July 17			—
,, 21			—
,, 28			—
Aug. 5			—
,, 14			—

EXPERIMENT 49.—Brindled Dog.

April 6, 1903. Injected 1 c.c. of cerebro-spinal fluid, containing trypanosomes from a case of Sleeping Sickness into this dog.

June 16. Died June 17. *Post-mortem.*—No ankylostomiasis. Tumours in stomach wall of spiroptera sanguinolenta. Heart, lungs, liver, and kidneys look healthy. Spleen enlarged.

Remarks.—It is impossible to say what was the cause of this dog's death. It may have been the trypanosomes, but this seems most improbable. The temperature curve remained normal throughout, and showed no reaction to the presence of the trypanosomes in the blood.

The following table shows the presence or absence of trypanosoma in the blood :—

Date.	Parasites in blood.		
	Filaria.	Malaria.	Trypanosoma.
1903.			
Apr. 24			—
May 4			+
,, 11			—
,, 19			+
,, 26			+
June 2			+ (scanty)
,, 9			+
,, 16			+

Experiment 144.—Brindled Pup.

To note effect of subcutaneous injection of cerebro-spinal fluid containing trypanosomes from a case of Sleeping Sickness into a pup.

June 23, 1903. Injected 4 c.c. of cerebro-spinal fluid containing trypanosomes into this pup.

The following table shows the presence or absence of trypanosoma in the blood :—

Date.	Parasites in blood.		
	Filaria.	Malaria.	Trypanosoma.
1903.			
June 30			—
July 17			—
,, 21			—
,, 28			—
Aug. 4			—
,, 14			—
,, 18			—

Experiment 145.—Fawn-coloured Pup.

June 23, 1903. Injected subcutaneously, 4 c.c. of cerebro-spinal fluid containing trypanosomes into this pup.

Date.	Parasites in blood.		
	Filaria.	Malaria.	Trypanosoma.
1903.			
June 30..........			—
July 17..........			—

July 19. Died. No trypanosomes in the blood. Died of ankylostomiasis.

B.—*The Injection of Blood Containing Trypanosomes from Cases Showing no Symptoms of Sleeping Sickness.*

Experiment 65.—Dog (Brown).

April 15, 1903. Injected subcutaneously 2 c.c. of blood containing trypanosomes from Case 66, Tabula, Marine.

May 11. Dog very emaciated and can hardly stand. Refuses food and is apparently dying. Very anæmic. Paresis of hind extremities. No œdema. No opacity of cornea.

Blood examination.—Red blood corpuscles, 1,700,000 per c.cm.
,, ,, White blood corpuscles, 60,940 ,,
,, ,, Trypanosomes *present* in very small numbers.

Lymphocytes, 34 per cent.; large mononucleated, 12 per cent.; polynucleated, 54 per cent.

Eosinophile cells, 0 per cent.; nucleated red blood corpuscles, 6 per cent.

Date.	Parasites in blood.		
	Filaria.	Malaria.	Trypanosoma.
1903.			
Apr. 24..........			—
,, 27..........			—
May 4..........			+
,, 11..........			+

May 12th. Died 10.15 A.M. Autopsy immediately after death. The blood is extremely pale and watery. All the organs are bloodless but healthy. The œsophagus shows a small tumour about 2 inches above the cardiac orifice of the stomach, which contains spiroptera sanguinolenta. The wall of the stomach also shows from 15 to 20 tumours of the same parasite, some of them as large as a walnut. The intestine is the seat of innumerable uncinaria trigonocephala, and presents a remarkable appearance. Four inches from the pylorus these ankylostomata begin, and they become more and more numerous until in the ilium they exist in thousands. The greater part of the small intestine is coloured a deep dusky red by numerous hæmorrhages, and the large intestine is full of black blood of the consistency and appearance of tar.

Remarks.—The temperature curve remained fairly normal until within a few days of death, when it became sub-normal. Death was due to ankylostomiasis.

EXPERIMENT 72.—Dog. Small Black and Tan. Male.

April 28. Injected 2 c.c. of blood containing trypanosomes from Case 66, Tabula, Marine.

Date.	Parasites in blood.		
	Filaria.	Malaria.	Trypanosoma.
1903.			
May 11..........			+
„ 19..........			+
„ 26..........			+
June 2..........			+

June 7. Died from anæmia, due to ankylostomiasis.

EXPERIMENT 122.—Dog. Small Black and Tan.

May 20, 1903. Injected subcutaneously 10 c.c. of blood from Case 66, Tabula, Marine.

The following table shows the presence or absence of trypanosoma in the blood :—

Date.	Parasites in blood.		
	Filaria.	Malaria.	Trypanosoma.
1903.			
June 2			+
,, 9			+
,, 16			—
,, 24			—
,, 30			—
July 17			—
,, 21			—
,, 28			—
Aug. 4			—
,, 14			—
,, 18			—

Experiment 146.—Black Pup.

June 23, 1903. Injected subcutaneously 4 c.c. of blood from Case 64, Jordien Murjan, into this dog.

The following table shows the presence or absence of trypanosoma in the blood :—

Date.	Parasites in blood.		
	Filaria.	Malaria.	Trypanosoma.
1903.			
June 30			—
July 17			—
,, 21			—
,, 28			—
Aug. 4			—
,, 14			—
,, 18			—

Experiment 147.—Black and White Pup.

June 23, 1903. Injected subcutaneously 4 c.c. of blood from Case 64, Jordien Murjan, into this dog.

July 16. Dog died.

The following table shows the presence or absence of trypanosoma in the blood:—

Date.	Parasites in blood.		
	Filaria.	Malaria.	Trypanosoma.
1903.			
June 23..........			—
„ 30..........			—
July 16..........			—

On the Effect of the Injection of these Trypanosomes into Guinea Pigs, Donkeys, Oxen, Sheep and Goats.

EXPERIMENT 82.—Guinea Pig.

To note effect of subcutaneous injection of cerebro-spinal fluid containing trypanosomes from case of Sleeping Sickness into guinea pig.

May 5, 1903. Injected 5 c.c. of cerebro-spinal fluid containing trypanosomes into this guinea pig subcutaneously.

The following table shows the presence or absence of trypanosomes in the blood. Temperature curve remained normal throughout:—

Date.	Parasites in blood.		
	Filaria.	Malaria.	Trypanosoma.
1903.			
May 12..........			—
„ 19..........			—
„ 26..........			—
June 2..........			—
„ 9..........			—
„ 16..........			—
„ 24..........			—
„ 30..........			—
July 17..........			—
„ 21..........			—
„ 28..........			—
Aug. 4..........			—
„ 14..........			—
„ 18..........			—

Experiment 81.—Guinea Pig (Female).

To note effect of subcutaneous injection of blood containing trypanosomes from man showing no signs of Sleeping Sickness into guinea pig.

May 1, 1903. Injected ½ c.c. of blood from Case 66, Jordien Murjan, containing trypanosomes.

The following table shows the presence or absence of trypanosomes in the blood. Temperature curve remained normal throughout:—

Date.	Parasites in blood.		
	Filaria.	Malaria.	Trypanosoma.
1903.			
May 11			—
„ 19		—	—
„ 26			—
June 2			—
„ 9			—
„ 16			—
„ 24			—
„ 30			—
July 21			—
Aug. 4			—
„ 14			—
„ 18			—

Experiment 100.—Donkey.

To note effect of subcutaneous injection of cerebro-spinal fluid containing trypanosomes from case of Sleeping Sickness into a donkey.

May 14, 1903. Injected subcutaneously 6 c.c. of cerebro-spinal fluid containing trypanosomes from a case of Sleeping Sickness into this donkey.

The following table shows the presence or absence of trypanosomes in the blood:—

Date.	Parasites in blood.		
	Filaria.	Malaria.	Trypanosoma.
1903.			
May 14			—
„ 23			—
„ 27			—
June 3			—
„ 10			—
„ 17			—
„ 24			—
July 1			—
„ 17			—
„ 22			—
Aug. 5			—
„ 13			—
„ 19			—

EXPERIMENT 101.—Donkey.

To note effect of subcutaneous injection of blood containing trypanosomes from man showing no signs of Sleeping Sickness into donkey.

May 11, 1903. Examined blood. No trypanosomes. No malaria.

May 15. Injected 10 c.c. of blood subcutaneously from Case 68, Bara Risgallah, into this donkey.

May 26. Again injected 10 c.c. of blood from Case 68.

May 27. To-day a large swelling was noticed in the region of the second inoculation.

June 5. Abscess opened, several ounces of pus evacuated.

The following table shows the presence or absence of trypanosoma in the blood:—

Date.	Parasites in blood.		
	Filaria.	Malaria.	Trypanosoma.
1903.			
May 23			—
„ 27			—
June 3			—
„ 10			—
„ 17			—
„ 24			—
July 1			—
„ 17			—
„ 22			—
Aug. 5			—
„ 13			—
„ 19			—

EXPERIMENT 112.—Ox. Small yellow.

To note effect of subcutaneous injection of cerebro-spinal fluid containing trypanosomes from a case of Sleeping Sickness into oxen.

May 18, 1903. Blood examined. No trypanosoma. No other parasites.

Injected 10 c.c. of cerebro-spinal fluid containing trypanosomes from a case of Sleeping Sickness into this ox.

June 14. 10 c.c. of blood was taken and centrifuged; it was pale, and laked readily. No trypanosomes were found.

June 15. Died this morning.

The following table shows the presence or absence of trypanosoma in the blood:—

Date.	Parasites in blood.		
	Filaria.	Malaria.	Trypanosoma.
1903.			
May 27..........			—
June 3..........			—
,, 10..........			—
,, 14..........			—

Post-mortem.—Lymphatic glands much enlarged.

Heart.—At base a collection of yellow jelly-like material. This jelly-like material is found subcutaneously, and in the pelves of the kidneys, etc. This disease is known locally as (M'Kebbe), and an owner of cattle here informs us that 90 per cent. of deaths among his cattle are due to this.

This is an Ankole ox, and, therefore, said to be more liable to this disease. Cattle reared in this district are looked upon as less susceptible. Is this African Coast fever?

EXPERIMENT 132.—Ox. Small yellow.

June 17, 1903. Blood examined. Trypanosomes absent.

June 21. Injected subcutaneously 10 c.c. of cerebro-spinal fluid, containing trypanosomes from a case of Sleeping Sickness, into this ox.

The following table shows the presence or absence of trypanosoma in the blood:—

Date.	Parasites in blood.		
	Filaria.	Malaria.	Trypanosoma.
1903.			
June 24			—
July 1			—
,, 17			—
,, 22			—
Aug. 5			—
,, 13			—
,, 19			—

EXPERIMENT 111.—Ox. Big brown.

To note effect of subcutaneous injection of blood, containing trypanosomes from a man showing no signs of Sleeping Sickness, into an ox.

May 18, 1903. Examined the blood. Trypanosoma absent. No parasites seen.

May 19. Injected 10 c.c. of blood from Case 31, Karala Barigi, containing trypanosomes, into this ox.

May 25. Injected 5 c.c. of blood from Case 64, Jordien Murjan.

June 21. Died this morning.

Post-mortem. The same appearance as Experiment 112 (M'Kebbe).

The following table shows the presence or absence of trypanosoma in the blood :—

Date.	Parasites in blood.		
	Filaria.	Malaria.	Trypanosoma.
1903.			
May 27			—
June 3			—
,, 10			—
,, 17			—

That oxen in Entebbe do harbour trypanosomes is proved by the fact that, of three sent to us by Mr. Pordage, P.W.D., for examination, two were found to have trypanosomes in their blood. These cattle were emaciated, their hair stared, and they looked decidedly out of health. As the trypanosomes in the blood of these oxen might be the Nagana parasite, 2 c.c. of blood from one of them was injected into a dog. The following experiment shows with what result :—

EXPERIMENT 128.—Dog. Brown.

To note effect of subcutaneous injection of blood from Mr. Pordage's brown ox, which was found to contain trypanosomes, into a dog.

June 3, 1903. Injected subcutaneously 2 c.c. of blood.

August 16. Re-injected 5 c.c. blood from same ox, containing trypanosomes.

The following table shows the presence or absence of trypanosoma in the blood:—

Date.	Parasites in blood.		
	Filaria.	Malaria.	Trypanosoma.
1903.			
June 9			—
" 16			—
" 24			—
" 30			—
July 17			—
" 21			—
" 28			—
Aug. 4			—
" 14			—
" 18			—
			—

Mr. Pordage informs us that these oxen came to Entebbe from British East Africa about the end of 1900. They kept remarkably well for more than two years. During this time they were grazed on high ground away from the lake shore. About the beginning of 1903 they were sent to graze in and about the forest, which fringes the lake. To this circumstance Mr. Pordage attributes their illness. It is impossible at present to say what species of trypanosoma these cattle harbour. It does not seem to be Nagana, or the dog would have died. On the other hand, we have failed to inoculate *young* oxen with the trypanosomes of Sleeping Sickness.

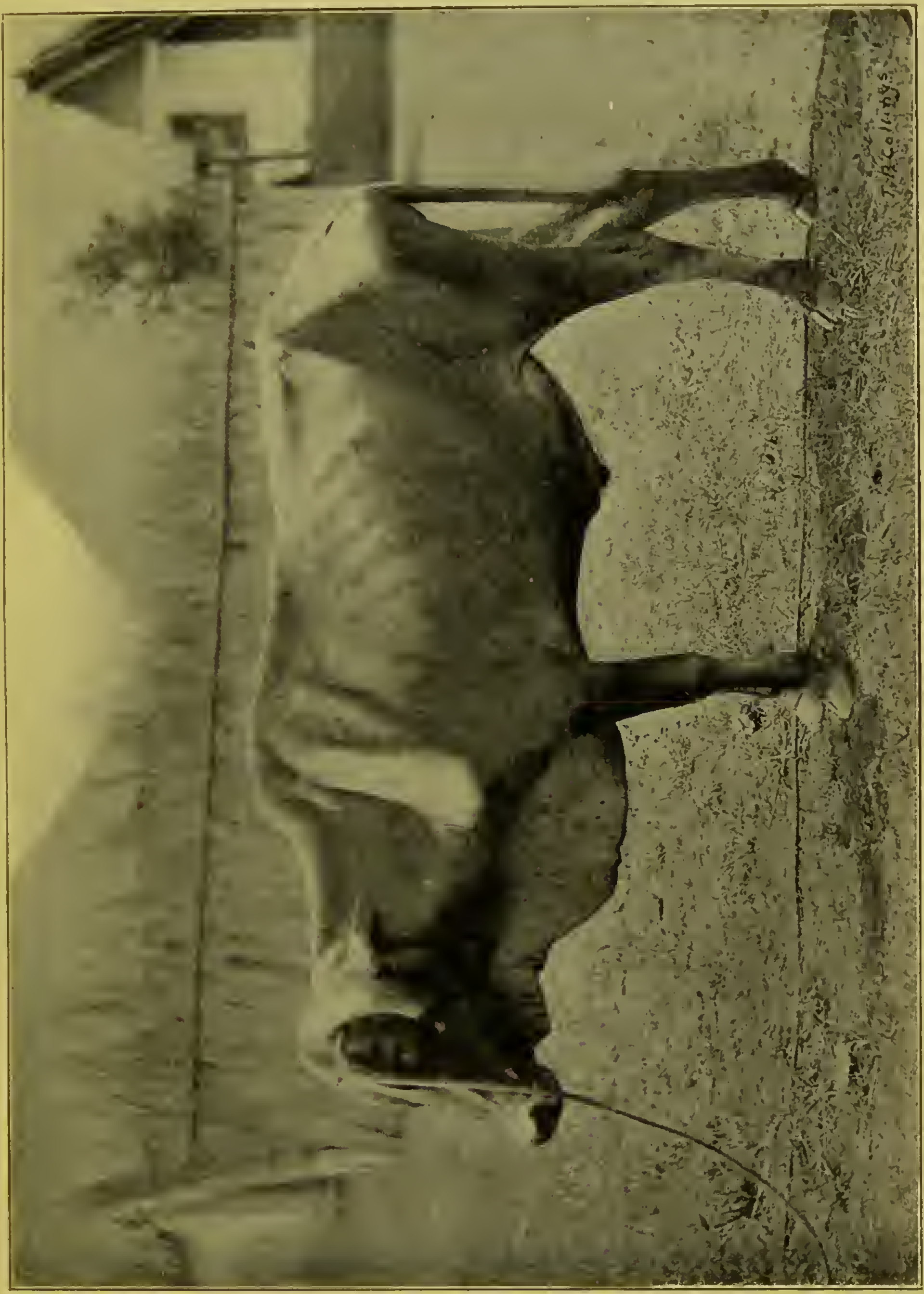
Further experiments are being made to try to decide this question.

The accompanying plate shows the appearance of Mr. Pordage's ox.

EXPERIMENT 150.—Goat.

To note effect of subcutaneous injection of cerebro-spinal fluid, containing trypanosomes from a case of Sleeping Sickness into goats.

June 30, 1903. Injected 10 c.c. of cerebro-spinal fluid, from a case of Sleeping Sickness, into this goat.



Mr. Pordage's Ox.

July 1. Trypanosomes absent.
July 17. Trypanosomes absent.
July 22. Goat died.

Post-mortem.—Much fluid in the pericardium. Lungs have the same appearance as in South African horse sickness. Lymphatic glands much enlarged generally. Yellow jelly-like material at base of the heart.

Experiment 90.—Goat.

To note effect of subcutaneous injection of blood, containing trypanosomes from a man showing no signs of Sleeping Sickness into a goat.

May 11, 1903. Injected subcutaneously 5 c.c. of blood from Case 64, Jordien Murjan, containing trypanosomes, into this goat.

The following table shows the presence or absence of trypanosoma in the blood.

Date.	Parasites in blood.		
	Filaria.	Malaria.	Trypanosoma.
1903.			
May 20..........		–	–
,, 27..........			–
June 3..........			–
,, 10..........			–
,, 17..........			–
,, 24..........			–
July 1..........			–
,, 17..........			–
,, 22..........			–
Aug. 1..........			–
,, 13..........			–
,, 19..........			–

Experiment 89.—Sheep. Brown.

To note effect of subcutaneous injection of cerebro-spinal fluid containing trypanosomes from a case of Sleeping Sickness into a sheep.

May 11, 1903. Injected 10 c.c. of cerebro-spinal fluid containing trypanosomes from a case of Sleeping Sickness into this sheep.

June 30. Again injected 10 c.c. of fluid.

The following table shows the presence or absence of trypanosoma in the blood:—

Date.	Parasites in blood.		
	Filaria.	Malaria.	Trypanosoma.
1903.			
May 20..........			—
„ 27..........			—
June 3..........			—
„ 10..........			—
„ 17..........			—
„ 24..........			—
July 1..........			—
„ 17..........			—
„ 22..........			—
Aug. 5..........			—
„ 13..........			—
„ 19..........			—

EXPERIMENT 149.—Sheep. Small Brown and White.

To note effect of subcutaneous injection of blood containing trypanosomes from a man showing no signs of Sleeping Sickness into sheep.

June 25, 1903. Injected subcutaneously 5 c.c. of blood from Case 63, Kumsarsabba, into this sheep.

The following table shows the presence or absence of trypanosoma in the blood:—

Date.	Parasites in blood.		
	Filaria.	Malaria.	Trypanosoma.
1903.			
July 1			—
„ 17..........			—
„ 22..........			—
Aug. 5..........			—
„ 13..........			—
„ 19..........			—

9. *Are We Dealing with one or more than one Species of Trypanosoma?*

As has been shown, no morphological difference can be made out between the trypanosomes found in the cerebro-spinal fluid of cases of Sleeping Sickness, and those found in the blood of persons evidently in good health. Neither can any difference be detected in their behaviour when inoculated into various animals. More experiments are required and more results obtained before this question can be answered unhesitatingly, but at present the evidence distinctly tends to show that we are dealing with one species of Trypanosoma, and that species is probably *Trypanosoma Gambiense*, discovered by Forde and described and named by Dutton.

10. *The History and Distribution of Sleeping Sickness in Uganda.*

According to Dr. Moffat, C.M.G.,* Principal Medical Officer, British East Africa and Uganda Protectorates, the first cases of Sleeping Sickness in Uganda were reported by the Drs. Cook, C.M.S. Medical Mission, Mengo, in April, 1901. These cases came from Busoga. On Dr. Moffat's return from leave in April 1902, he was surprised to find that the disease had become epidemic in Busoga, and that it had spread into the neighbouring parts of Uganda and Kavirondo.

He is of opinion that the disease is not indigenous to Uganda, but has been imported during recent times from the Congo basin. This he thinks " is no matter for surprise when we consider that the opening up of Equatorial Africa has led to inter-communication between countries and districts which in earlier days were absolutely cut off from each other." He is inclined to explain the first appearance of the disease in Busoga, by the fact that a large number of Emin Pasha's Soudanese, accompanied by a multitude of slaves from the Congo territories west of Lake Albert, were brought in and settled in Busoga. Dr. Hodges who studied the question in Busoga thinks it first broke out there in 1896. Be this as it may, the disease is now widely spread round the northern shores of the Victoria Nyanza from Buddu on the west, to south of Kavirondo Bay on the east. As far as I am aware the disease has not yet entered German territory.

As the first Sleeping Sickness Commission sent out by the Royal Society made this part of the subject, the distribution of the disease, an object of special investigation, it was thought unnecessary to pursue the subject further. Full details of the work done are not at present available, but for the purposes of this report it may be stated that this disease has a remarkable distribution, being confined to the lake shore and to the islands. How wide the strip of lake shore affected by the disease is, differs in different parts.

Mr. Cubitt, Assistant Collector, Busoga, who investigated the distribution of the disease in his district, in a report to the Commissioner, dated Jinja, June 14, 1902, says " it would seem to be a fairly accurate statement to make that Sleeping Sickness confines itself to the territories adjoining the lake, roughly speaking from a 10 to 20 mile radius of the coast, and that the people living further inland suffer in proportion to the greater or less trading transactions they have with the people living within that radius, while in those who have no trading transactions with the people of the lake there are found no traces of the disease."

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* Foreign Office Despatch, August 5, 1902, Inclosure 2—
Preliminary Notes on Sleeping Sickness by the Principal Medical Officer, June 17, 1902. Inclosures 3 and 4—Dr. Hodges to Dr. Moffat, May 8, 1902, and May 26, 1902.

In the opinion of the Uganda Prime Minister, Apolo, a strip 10 to 15 miles wide would cover the affected area, and any cases found further inland are imported.

The numerous islands which lie near the northern shores of the lake are also the seat of the disease. Between these islands and the mainland, and for several miles inland a constant interchange of commodities and intercourse between the natives takes place.

There must be some reason for this peculiar distribution. It cannot be due to a food poison, as the natives outside this narrow strip have the same habits. Then, again, if the trypanosomes are the cause of the disease, which there is every reason to suspect, the infection cannot be conveyed in food or clothes, or directly from man to man, but most probably must be carried by some blood-sucking insect.

This led the Commission to ask themselves the following question.

11. *Does the Distribution of Sleeping Sickness coincide with the Distribution of any biting Insect?*

On the analogy of Nagana a Tsetse fly was suspected. But the tsetse was not supposed to be present at altitudes of 3000 feet and upwards, nor was it known to be found in Uganda.* A short search in the Botanical Gardens, Entebbe, disposed of these objections. A tsetse fly very similar to the one met with in the fly country, Zululand, was found in numbers. For three months we have had on an average 400 tsetse flies brought into the laboratory every day by a few native children. These flies were caught on the lake shore in the immediate vicinity of Entebbe. This gave a lead. The Prime Minister and Regents were asked to meet the Commission and have the matter explained to them. They at once recognised the fly as one known to the Muganda as Kivu and said that it was found along the shores of the lake.† They were supplied with several dozen nets, killing bottles and boxes, and on their part promised to have the distribution of the fly worked out. A letter was also addressed to the Bishops of Uganda, who kindly promised to obtain information from their Missionaries. Every official and Missionary in the country was then sent a specimen of the tsetse fly, and informed by letter as follows:—

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* Since the above was written I find that Mr. F. J. Jackson in a despatch to the Foreign Office, dated September 27, 1901, writes, "I may add that there is a species of Tsetse fly found along the wooded portion of the lake-shore here at Entebbe. It is plentiful in the Botanical Gardens."

† The tsetse flies found near Entebbe were sent to Professor Ray Lankester, the Director of the British Museum (Natural History), on March 25, and identified by Mr. E. E. Austen as *Glossina palpalis* (Rob. Desv.). He writes: "this is the West African species, and its occurrence in Uganda is very interesting, and was quite unexpected by me, though it is true that another species, *Glossina fusca*, occurs both in West and East Africa."

"Sleeping Sickness in many ways, is very similar to the Fly Disease of South Africa. It is caused by the same kind of parasite, and is possibly carried from man to man by some insect, as the fly disease is carried by the tsetse fly (*Glossina pallidipes*). A species of tsetse fly (*Glossina palpalis*) is also found in Uganda, especially along the shores of the lake and in the islands. It is possible that this fly acts as the carrier of the infective agent of Sleeping Sickness. If this is so, the disease can only occur in places where the fly is found. In other words, no tsetse fly, no Sleeping Sickness.

"In order to settle this question the distribution of this fly must be carefully worked out. To assist in this would you kindly send collections of biting flies from your district and answer the following questions:—

(1) Is the tsetse fly (*Glossina palpalis*) found in your district?

(2) In what kind of place is the fly found—marsh, banana plantation, bank of river, shore of lake, forest, bush or open places?

(3) When does it bite, during the morning, mid-day, or at night?

(4) Is it numerous?

(5) What animals does it bite?

(6) Does Sleeping Sickness occur in the same place, distinguishing of course between imported cases and those which have been infected on the spot?

"The best way to catch the flies is by means of a small butterfly net. They can then easily be killed by a squeeze and placed in a small envelope with the name of the place and date of capture written on it.

"I may add that the natives call the fly Kivu, plural Bevu.

"It is important that the position of the place in which these tsetse flies are found should be exactly laid down. This can be done by giving the latitude and longitude in degrees and minutes, or by saying how many miles it is from a known place in a westerly or S.S.W., etc., direction. Still better would it be to make a tracing of the district, and on this to map out the distribution of the fly and of the sickness.

"It is no use trusting to report. The flies themselves must be caught and sent here for identification. The natives use the word Kivu for several varieties of biting flies.

"If no tsetse flies are found in the district, please send specimen of any of the various biting flies or insects known to the natives."

During June, July, and August some 460 collections of biting flies were sent in from all parts of Uganda. As each package came in the contents were sorted into tsetse flies and other biting flies. If the parcel contained one or more tsetse flies a round red disc was stuck on a map over the locality from which the flies had been sent. If on the other hand no tsetse were found a blue disc was fixed over the spot.

In the same way and at the same time a second map was prepared to show the distribution of Sleeping Sickness. That is to say, if the note on the parcel of flies stated that Sleeping Sickness is prevalent then a red disc was placed over the locality, and if on the contrary no cases of Sleeping Sickness were reported a blue disc was affixed.

Where cases were reported to have been introduced from some other locality, and to have died out without any spread of the disease in the neighbourhood, then a yellow disc was used.

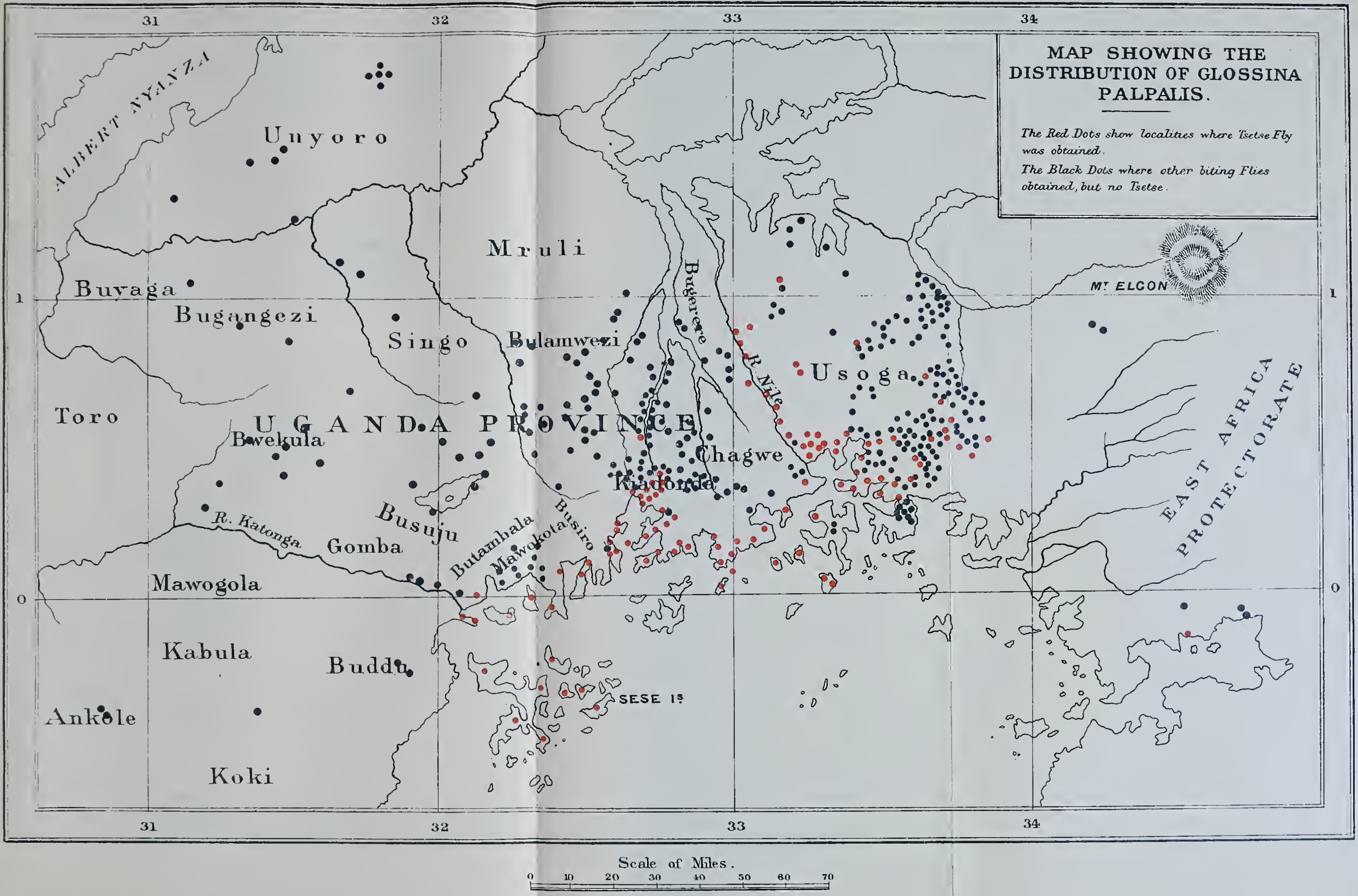
It is evident that two maps so prepared should show at a glance whether the distribution of Sleeping Sickness and *Glossina palpalis* corresponds or not. The accompanying Maps are taken from the originals. They are reduced to one third the size of the larger maps, and the blue discs above mentioned are replaced by black.

On comparing these two maps the similarity of the distribution of Sleeping Sickness and *Glossina palpalis* is self evident. The disease and the fly are limited to the shores of the lake and to the islands, except in Busoga where some of the red dots are seen in the centre of the district. The fly is also seen to pass up the Nile. This is probably due to the fact that the Nile is a great broad waterway, where it issues from the lake at the Ripon Falls, and may be looked upon in its physical characters as an arm of the lake. The other Uganda rivers are mere swamps full of papyrus. As it appeared important to personally examine one of these so-called rivers to discover how far the tsetse fly could be traced up their valleys, one of us (Dr. Nabarro) proceeded on July 4 to explore the Katonga River.

An account of this Expedition is given by Dr. Nabarro as follows:—

"This Expedition proceeded, by canoes, from Entebbe to the Island of Bussi. The tsetse fly was not sought here, as it had been previously found by Colonel Bruce. Then it visited the Islands Zinga and Bunjako, in both of which the tsetse fly was easily found along the shore of the lake where there was forest and short grass. Sleeping Sickness is prevalent on all three islands. Buganga was the next place visited and here, too, the tsetse fly was found as well as large numbers of Tabanidæ. Sleeping Sickness is prevalent in Buganga.

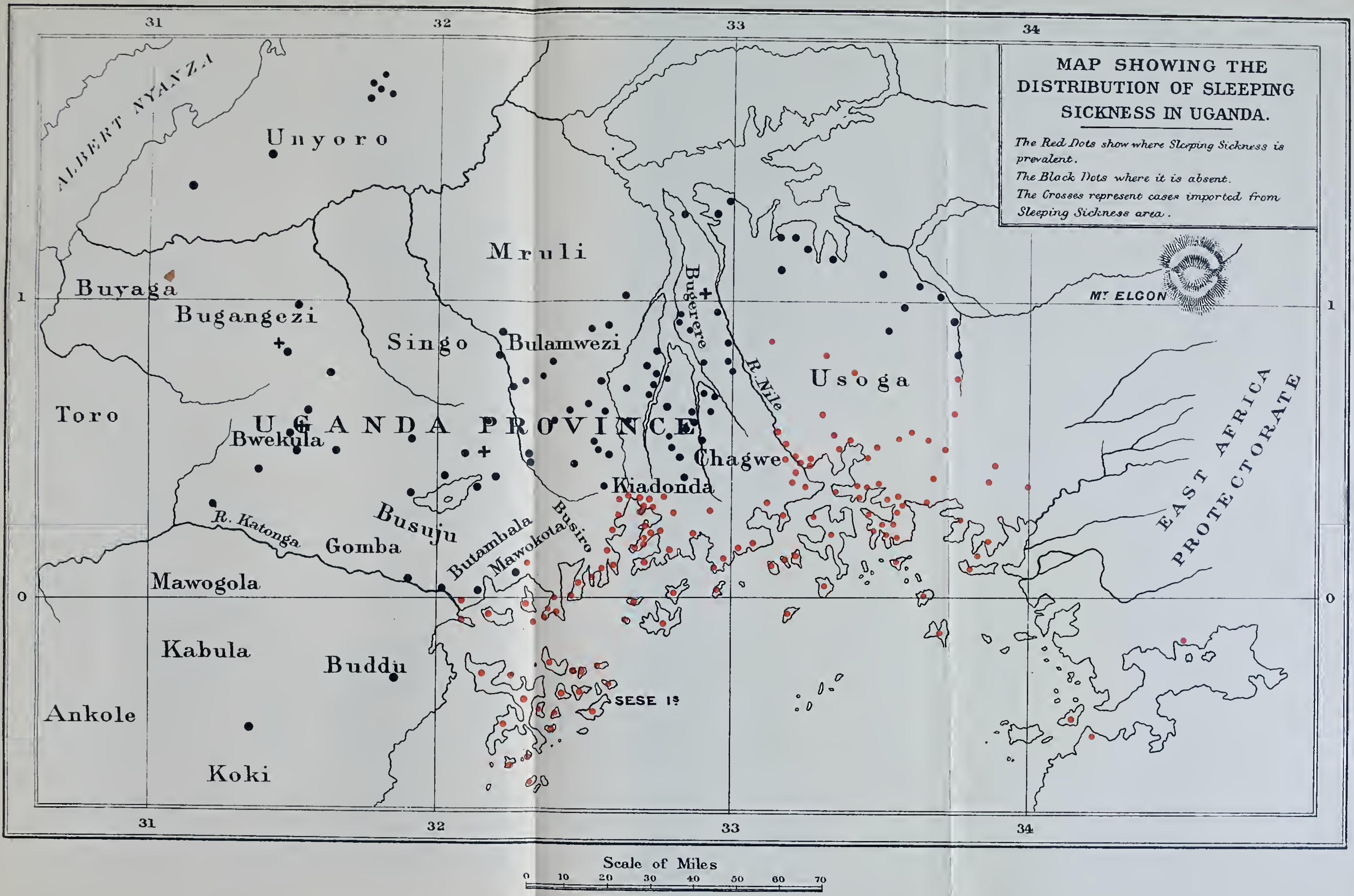
"We left Buganga and sailed round the Katonga Bay to see if there were any channel up the Katonga River but we could find none, the so-called river being a papyrus swamp about 1200 yards wide. We then went further on and landed near Magambo, where forest comes down to the edge of the lake. Here too, the tsetse flies were caught



MAP SHOWING THE DISTRIBUTION OF GLOSSINA PALPALIS.

The Red Dots show localities where Tsetse Fly was obtained.

The Black Dots where other biting Flies obtained, but no Tsetse.



MAP SHOWING THE DISTRIBUTION OF SLEEPING SICKNESS IN UGANDA.

The Red Dots show where Sleeping Sickness is prevalent.

The Black Dots where it is absent.

The Crosses represent cases imported from Sleeping Sickness area.

in numbers and there were several cases of Sleeping Sickness in the neighbourhood.

"From Magambo we marched across the Kibikuta River (1800 yards wide) about 2 miles from where it enters the Victoria Nyanza. No tsetse flies were found there. Thence we marched to the Katonga River, which like the Kibikuta is merely a papyrus swamp. The left bank of the Katonga was explored, from the lake shore, close to the mouth of the river, to a point about 13 or 14 miles up the river and no tsetse flies were seen. So far as I was able to ascertain there is no Sleeping Sickness in this district.

"The return journey to Entebbe was made by road, passing through Metala Maria and Kianjia. In neither of these villages were any tsetse flies found, though Stomoxys and other biting flies exist in large numbers. These two villages are situated about 2—3 miles from the shore of the lake, which here consists of a vast papyrus swamp between the mainland and adjacent Islands Bunjako, Zinga, and Bussi. No tsetse flies were found on the shore close to this swamp. There is no Sleeping Sickness at Mitala Maria or Kianjia.

"From Kianjia we went along the main road to Karabara (5½ miles distant), where we found no tsetse flies and where there is no Sleeping Sickness. We then travelled by the porters' road for 10 miles, *viâ* Busami and Gabongas, and did not find any tsetse flies until we reached the shore of the lake at 'the ferry' near Entebbe. Here many flies were easily caught in the dense forest that there runs along the lake shore. I was informed that there were several cases of Sleeping Sickness in the 'Shambas' near the lake shore, but that there were none in the interior—at Busami or Gabongas."

The main points of interest in Dr. Nabarro's account are that the fly does not proceed up the swampy river valleys and that even on the coast behind papyrus swamps it is also absent.

On the map this journey is shown by a series of red dots on the islands and on the shore at the mouth of the Katonga River, and by blue dots up the river and along the shore behind the islands. The space between the islands and the mainland is one huge papyrus swamp.

In order to work out more minutely the habits of the *Glossina palpalis*, the peninsula on which Entebbe stands was taken in detail and carefully searched for the fly. The result of this showed that the fly is only found on the shore of the lake where there is forest. This forest is thick jungle with high trees and dense undergrowth. The fly is never found on open sandy beaches backed by grass plains, even although there may be some small scrub near the water's edge. It is never found in the grass of the grassy plains, even though the grass be long and tangled. It has not been found by us in banana plantations, nor at any time far from the lake shore.

The habitat then of this fly, in the neighbourhood of Entebbe, is the shore of the lake where there is forest. In Uganda generally the same seems to hold good. In Busoga, on the other hand, it appears to be found inland, but what the physical characters of this province are which would account for this I have not learnt. The fly also passes down the Nile as far as Kakoge Ferry some 50 miles north of the Ripon Falls, and it has even been received from Fajao on the Somerset Nile, and from Tengri and the Achwa River, still further north and near Wadelai.

It is important that the distribution of this fly should be fully worked up, but enough has been done to show that the distribution of this species of tsetse fly is, like Sleeping Sickness, confined to the shores of the lake and the islands. It is on the densely wooded shore of the lake that the half-naked natives of the mainland and islands meet in thousands to trade in fish, bananas, earthenware, etc. If the *Glossina palpalis* can act as a carrier of the trypanosoma of Sleeping Sickness, the circumstances could not be made more favourable than they are for the spread of the disease.

12. *Can the Uganda Tsetse Fly* (Glossina palpalis) *Carry the Trypanosoma Found in Sleeping Sickness Cases to Healthy Animals?*

The animal chosen to carry out these experiments was the monkey. These are by far the most suitable animals to work with here. They are easily procured, easily fed, and keep their health perfectly in captivity. The method used was simply to feed tsetse flies on a Sleeping Sickness case and at varying intervals of time to place the same cage of flies on the monkey. The Sleeping Sickness patients did not seem to feel the bites of the flies, as they made no complaint or other signs of inconvenience. There was, as a rule, about 30 flies in each cage, but only those which filled themselves were reckoned as having fed. The following experiments are given in full, as this point is of great importance :—

EXPERIMENT 114.—Monkey (*Cercopithecus* sp.).

Feeding tsetse flies on a healthy monkey 8 hours after they had been fed on a Sleeping Sickness patient.

Date.	Number of flies fed on—		Trypanosomes.
	Patient.	Monkey.	
May—			
20	22	0	Absent
22	4	5	
23	11	2	
23	9	7	
24	9	6	
25	15	1	
26	10	4	
27	6	5	
28	8	7	Absent
29	5	4	
30	9	3	
31	5	1	
June—			
1	1	9	
2	6	2	
3	8	1	
4	4	2	Absent
5	4	3	
6	5	5	
7	0	0	
8	13	9	
9	8	4	
10	9	5	
11	10	6	Absent
12	8	5	
13	9	6	
14	0	0	
15	4	12	
16	8	10	
17	2	1	
18	2	5	Absent
19	7	4	
20	5	4	
21	0	0	
June—			
22	16	2	
23	24	14	
24	31	10	
25	25	17	Absent
26	28	8	
27	17	15	
28	0	0	
29	26	26	
30	24	22	
July—			
1	18	15	Absent
2	29	16	
3	28	11	
4	27	14	
5	19	13	
6	31	16	
7	32	11	
8	23	13	
9	12	15	
10	14	0	
11	14	28	
12	28	6	
13	22	18	
14	19	12	
15	18	8	
16	17	13	
17	24	9	Absent
18	20	8	
19	12	11	
20	23	17	
21	16	13	
22	17	11	
23	..	..	Present

EXPERIMENT 115.—Monkey (*Cercopithecus* sp.).

Feeding tsetse flies on a healthy monkey 8 hours after they had been fed on a Sleeping Sickness patient.

Date.	Number of flies fed on—		Trypanosomes.
	Patient.	Monkey.	
May—			
20	12	0	Absent
21	0	3	
22	10	2	
23	6	1	
24	7	2	
25	11	5	
26	8	4	
27	11	1	
28	6	3	
29	9	8	Absent
30	9	4	
31	9	3	
June—			
1	2	9	
2	9	7	
3	5	2	
4	6	4	Absent
5	2	3	
6	8	7	
7	0	0	
8	4	10	
9	5	4	
10	5	4	
11	9	5	Absent
12	2	7	
13	3	3	
14	0	0	
15	6	12	
16	12	12	
17	7	2	
18	14	2	Absent
19	4	2	
20	3	4	
21	0	0	
June—			
22	29	9	
23	18	9	
24	21	21	
25	23	14	Absent
26	17	6	
27	16	9	
28	0	0	
29	33	27	
30	28	21	
July—			
1	22	17	Absent
2	22	19	
3	21	13	
4	24	10	
5	33	10	
6	33	10	
7	29	12	
8	10	16	
9	10	12	
10	16	13	
11	6	18	
12	29	8	
13	18	11	
14	14	9	
15	18	12	
16	18	7	
17	30	7	Absent
18	35	17	
19	28	8	
20	30	8	
21	25	7	
22	21	14	
23	..	..	Present

EXPERIMENT 99. Monkey *Cercopithecus* (sp.).

Feeding tsetse flies on a healthy monkey 24 hours after they had been fed on a Sleeping Sickness patient.

Date.	Number of flies fed on—		Trypanosomes.
	Patient.	Monkey.	
May—			
15	16		
16	..	7	Absent
17	6		
18	..	6	
19	16		
20	..	3	
21	12	2	
22	..	5	
23	9		
24	..	7	
25	5		
26	..	8	
27	11		
28	..	5	
29	7	..	Absent
30	..	9	
31	6		
June—			
1	..	7	
2	9		
3	..	6	
4	5		
5	..	4	Absent
6	8		
7	..	0	
8	10		
9	..	6	
10	17		
11	..	18	
12	18		
13	..	17	
14	0		
15	8		
16	..	11	
17	0		
18	10	..	Absent
June—			
19	..	12	
20	15		
21	..	0	
22	..	11	
23	21		
24	..	23	
25	26	..	Absent
26	..	20	
27	19		
28	..	10	
29	52		
30	..	46	
July—			
1	15	..	Absent
2	..	20	
3	31		
4	..	45	
5	27		
6	..	27	
7	40		
8	..	17	
9	15		
10		15	
11	15		
12	..	21	
13	27		
14	..	28	
15	21		
16	..	24	
17	23	..	Absent
18	..	23	
19	36		
20	..	16	
21	26		
22	..	29	
23	..	..	Present

EXPERIMENT 97. Monkey (*Cercopithecus* sp.).

Feeding tsetse flies on a healthy monkey 24 hours after they had been fed on a Sleeping Sickness patient.

Date.	Number of flies fed on —		Trypanosomes.	Date.	Number of flies fed on —		Trypanosomes.
	Patient.	Monkey.			Patient.	Monkey.	
May—				June—			
15	11	..	Absent	8	28		
16	..	1		9	..	16	
17	5			10	17		
18	..	8		11	..	24	Absent
19	10			12	25		
20	..	5		13	..	20	
21	8			14	0		
22	..	9	Absent	15	11		
23	13			26	..	19	
24	..	8		17	14		
25	6			18	19	..	Absent
26	..	9		19	..	7	
27	5	..	Absent	20	15		
28	..	4		21	..	0	
29	5			22	..	16	
30	..	7		23	17		
31	4			24	..	12	
				25	8	..	Absent
June—				26	..	9	
1	..	1		27	23		
2	4			28	..	9	
3	..	5		29	26		
4	5	..	Absent	30	..	56	
5	..	10					
6	14			July—			
7	..	0		1	..	..	Present

EXPERIMENT 116.—Monkey (*Cercopithecus* sp.).

Feeding tsetse flies on a healthy monkey 48 hours after they had been fed on a Sleeping Sickness patient.

Date.	Number of flies fed on—		Trypanosomes.
	Patient.	Monkey.	
May—			
20	10	..	Absent
21			
22	..	10	
23			
24	9		
25			
26	..	5	
27			
28	9		
29			
30	..	6	Absent
31			
June—			
1	6		
2			
3	..	7	
4	..	..	Absent
5	11		
6			
7	..	4	
8			
9	6		
10			
11	..	7	Absent
12			
13	16		
14			
15	..	8	
16			
17	17		
18	11	..	Absent
19			
20	..	3	
21			
22	19		
23			
24	..	15	
25	..	..	Absent
26	26		
27			
28	..	16	
29	9		
30			
July—			
1	..	49	
2			
3	51	..	Absent
4			
5	..	29	
6			
7	40		
8			
9	..	20	
10			
11	25		
12			
13	..	26	
14			
15	25		
16			
17	..	16	Absent
18			
19	64		
20			
21	..	46	
22			
23	..	..	Present

As the result of these five experiments it may be considered proved that *Glossina palpalis* can convey trypanosomes from Sleeping Sickness cases to healthy monkeys up to at least 48 hours after feeding. We have seen that every third or fourth native in the Sleeping Sickness area carries trypanosomes in his blood, so that the fly has plenty of material to draw from. It may be objected that the parasites are so scarce in the blood that it is unlikely the fly will get hold of them. The same objection might be urged in regard to Nagana, whose trypanosoma is probably scarcer in the blood of the wild animals than is the case in Sleeping Sickness. No doubt cases do occur among Sleeping Sickness patients, though rarely, in which the trypanosomes are fairly numerous. It is thought that they may be more numerous in the early stages when still confined to the blood than in the later stage of Sleeping Sickness. The observations on this point are as yet neither numerous or exact enough to warrant any dogmatic statement.

The next series of experiments was made to find out if the ordinary wild tsetse flies, freshly caught and placed on healthy monkeys without any artificial feeding, will give rise to the disease.

This is a still more important point, and in this also the experiments are given in full. The flies were caught on the shore of the lake in the vicinity of Entebbe, and when brought to the laboratory were immediately placed on healthy monkeys.

13. *Can Freshly-Caught* Glossina palpalis *convey Trypanosomes to Healthy Animals?*

Experiment 94.—Monkey (*Cercopithecus* sp.).

To ascertain if tsetse flies, freshly caught in the vicinity of Entebbe, are carrying trypanosomes.

May 13, 1903. Blood examined. No trypanosomes. No malaria.

May 13......... Fed 31 flies freshly caught near Entebbe.
,, 15......... ,, 15 ,,
,, 18......... ,, 10 ,,
,, 19......... ,, 20 ,,
,, 20......... ,, 13 ,,
,, 21......... ,, 16 ,,

Blood examined. Trypanosoma absent. Malaria absent.

May 22......... Fed 20 flies.
,, 23......... ,, 25 ,,
,, 24......... ,, 17 ,,
,, 25......... ,, 31 ,,
,, 26......... ,, 18 ,,
,, 27.........

Blood examined. Trypanosomes *present.* Malaria absent.

Experiment 130. Monkey (*Cercopithecus* sp.).

To note the effect of feeding freshly-caught tsetse flies on a healthy monkey.

June 10, 1903. Fed 60 freshly-caught flies.
,, 11......... ,, 23 flies.

Blood examined. Trypanosomes absent. Malaria present.

June 12.........	Fed 12 flies.
,, 13.........	,, 26 ,,
,, 14.........	,, 20 ,,
,, 17.........	,, 25 ,,
,, 18.........	,, 10 ,,

Blood examined. Trypanosomes absent. Malaria present.

June 19.........	Fed 9 flies.
,, 20.........	,, 19 ,,
,, 21.........	,, 30 ,,
,, 22.........	,, 7 ,,
,, 23.........	,, 74 ,,
,, 24.........	,, 31 ,,
,, 25.........	,, 28 ,,

Blood examined. Trypanosomes absent. Malaria present.

June 26.........	Fed 83 flies.
,, 27.........	,, 64 ,,
,, 28.........	,, 27 ,,
,, 29.........	,, 38 ,,
,, 30.........	,, 62 ,,
July 1.........	,, 62 ,,

Blood examined. Trypanosomes absent. Malaria present.

July 2.........	Fed 140 flies.
,, 3.........	,, 35 ,,
,, 4.........	,, 34 ,,
,, 5.........	,, 23 ,,
,, 6.........	,, 44 ,,
,, 7.........	,, 14 ,,
,, 8.........	,, 34 ,,
,, 9.........	

Examined blood. Trypanosomes *present.* Malaria present.

Experiment 131. Monkey. (*Cercopithecus* sp.)

Feeding freshly-caught tsetse flies on a healthy monkey.

July 17.........	Fed 5 flies.
,, 18.........	,, 3 ,,
,, 19.........	,, 7 ,,
,, 20.........	,, 17 ,,

Examination of blood. Trypanosomes absent. Malaria present.

June 21	Fed 23 flies.
,, 22	,, 7 ,,
,, 23	,, 28 ,,
,, 24	,, 39 ,,
,, 25	,, 13 ,,

Examination of blood. Trypanosomes absent. Malaria present.

June 26	Fed 53 flies.
,, 27	,, 47 ,,
,, 28	,, 5 ,,
,, 29	,, 17 ,,
,, 30	,, 108 ,,
July 1	,, 36 ,,

Examination of blood. Trypanosomes absent. Malaria present.

July 2	Fed 98 flies.
,, 3	,, 45 ,,
,, 4	,, 28 ,,
,, 6	,, 38 ,,
,, 7	,, 17 ,,
,, 8	,, 36 ,,
,, 9	,, 57 ,,
,, 10	,, 30 ,,

Examination of blood. Trypanosomes *present.* Malaria present.

These important experiments have succeeded quicker than we anticipated.

The flies were caught in the vicinity of the hut-tax labourers' camp. These men to the number of thousands come to Entebbe and work for Government for one month in lieu of paying hut-tax. They live in rudely built grass huts near the shores of the lake, about a mile from Entebbe, along the Kampala Road. Tsetse flies caught at this place and brought in cages to the laboratory have conveyed trypanosomes to three monkeys. What could be more suggestive? It is true that the trypanosoma, conveyed to these monkeys, may be a different species from that found in Sleeping Sickness, but taking everything into consideration, the probabilities are that it is the same.

If this is so it would be interesting and instructive to know what percentage of the hut-tax labourers develop this disease on their return to their homes. It may possibly be an extremely small figure, as these men are only exposed to the risk for a month, and, as a rule, their work lies in the town where tsetse flies are never found. This is very different to the case of the natives, who live all their lives on the edge of the lake and are exposed all the year round to the infection. In our opinion if these hut-tax labourers were camped on suitable ground, there would be little or no danger in their coming into Entebbe to do a month's work.

Up to the present we have received very few notices of the occurrence of cases of Sleeping Sickness, in Non-Sleeping Sickness areas, supposed to have been contracted in Entebbe or on the lake shore.

Five cases are reported by the White Fathers to have occurred at Kiambalangos Place, south of Hoima, and three cases in Bwekula* by Mr. Lewin. These men are stated to have contracted the disease round about the Victoria Lake, and have all died out without spreading the disease. Another curious case is reported by Major Harrison, K.A.R., at Nairobi, in British East Africa. The man was a bugler named Mahomed. He left Uganda in May, 1900, enlisted at Nairobi, British East Africa, on November 7th. 1900, and died of Sleeping Sickness February 18, 1902. Dr. Wiggins also relates the case of an Askari or native policeman named Sulivan Khair, stationed at Fort Ternan, British East Africa, for 2½ years before he developed the disease. He came from Entebbe, and except for a visit to Jinja, Busoga, 14 months before he died, he had not left Fort Ternan. Neither of these men set up infection among their comrades.

These cases hint at a long incubation period when the trypanosoma is confined to the blood, and also to the need of the tsetse fly to act as intermediary between the sick and healthy.

APPENDIX.

In the Progress Report several brief histories of cases were given. To these are added the following:—

CASE 28.—Kagoya. Female. Age 20 Years. District, Bukola, in Busoga. Food, Bananas, Sweet Potatoes, and Fish.

November 6, 1902. Admitted to hospital. Patient states that one sister died of Sleeping Sickness.

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* 1. Middle-aged man, two years in Chagwe, came to Bwekula ill, and died in about six months. In 1902.

2. Middle-aged man, one year round about Entebbe; came back ill; died in about four months. 1903.

3. Young man, trading near Victoria Lake six months; came back ill; died in about three months. 1903.

In all three cases no one suffered from Sleeping Sickness in the vicinity through contact with these.

March 27, 1903. She has been ill 7 or 8 months. The chief symptoms now are tremor, weakness, and peculiar speech.

April 7. *General Condition.*—The girl is very well nourished, in fact quite plump. She stands with difficulty, and for the last few days has been unable to walk without assistance. She seems to be quite intelligent, but her face is dull, listless, and expressionless, and she stares about in a vacant way with her eyes wide open. There is no œdema of any part of the body. The colour of the mucous membranes is normal, and there are no trophic changes. Lymphatic glands are generally enlarged, in the anterior triangles being about the size of peas, and in the inguinal region of beans. She complains of pain in the lower extremities. Her pulse is 100°. Her temperature subnormal. In regard to cutaneous eruptions, a few small ulcers can be seen on the chest, right arm and back.

Nervous System.—Her intelligence and memory are good. She is reported to sleep well at night and also a good deal during the day. Her speech is slow, tremulous, indistinct, faint and high pitched like a whimpering child. There is nothing noteworthy about her eyes. There is marked tremor of the tongue, but not of the lips or hands. Her muscular nutrition is very good, she is sensible to touch, temperature and pain, and her muscle sense is normal. In regard to her reflexes, the knee jerk is diminished, and the ankle clonus is present to a slight extent.

Alimentary System.—Her appetite is reported to be good, her tongue is moist, covered with white fur and indented by the teeth, otherwise there is nothing abnormal.

Circulatory System.—The apex beat is imperceptible, and on auscultation the heart sounds are weak, regular, and there is no bruit. The pulse has a rate of 100, with low tension, small size, easily compressible, and regular rhythm.

Respiratory System.—Nothing noteworthy.

Cutaneous System.—The skin is harsh and rough, and the papillæ are very prominent, especially over the legs and arms.

Eyes.—On ophthalmoscopic examination both found to be normal.

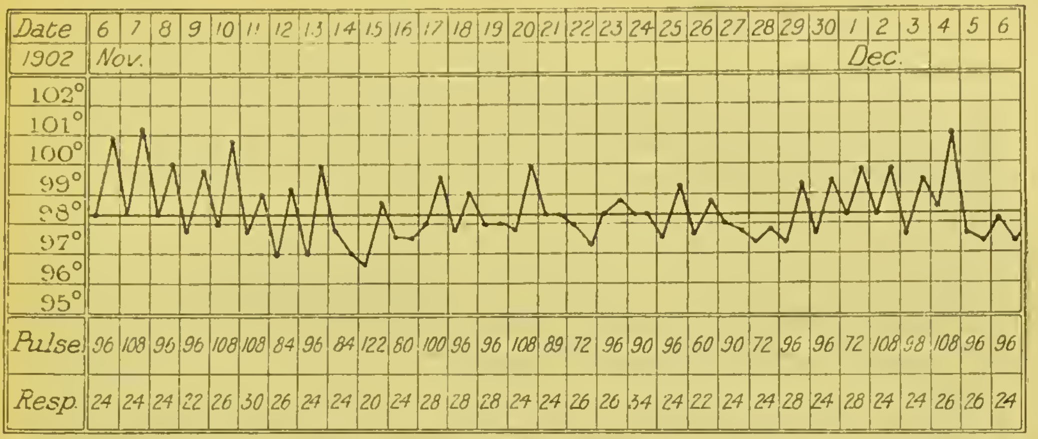
April 20. Patient is now very tremulous, the tremors of the tongue being marked. The heart action is feeble.

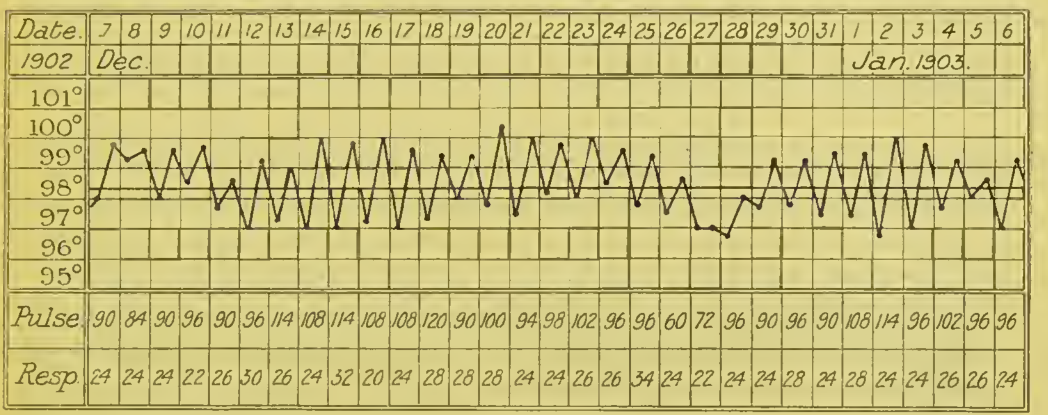
May 6. Patient has been bed-ridden for the last month. She lies all day in a lethargic condition.

May 28. Gradually getting feebler. She is still well nourished, and is able to sit up in bed.

June 5. Condition distinctly worse to-day. She is practically unconscious and her breathing is stertorous. Died 9 P.M.

The following chart represents the course of the disease:—


Date
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 1 2 3 4 5 6
1902
Nov.
Dec.
102°
101°
100°
99°
98°
97°
96°
95°
Pulse
96 108 96 96 108 108 84 96 84 122 80 100 96 96 108 89 72 96 90 96 60 90 72 96 96 72 108 98 108 96 96
Resp.
24 24 24 22 26 30 26 24 24 20 24 28 28 28 24 24 26 26 34 24 22 24 24 28 24 28 24 24 26 26 24


Date.
7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 6
1902
Dec.
Jan. 1903.
101°
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96°
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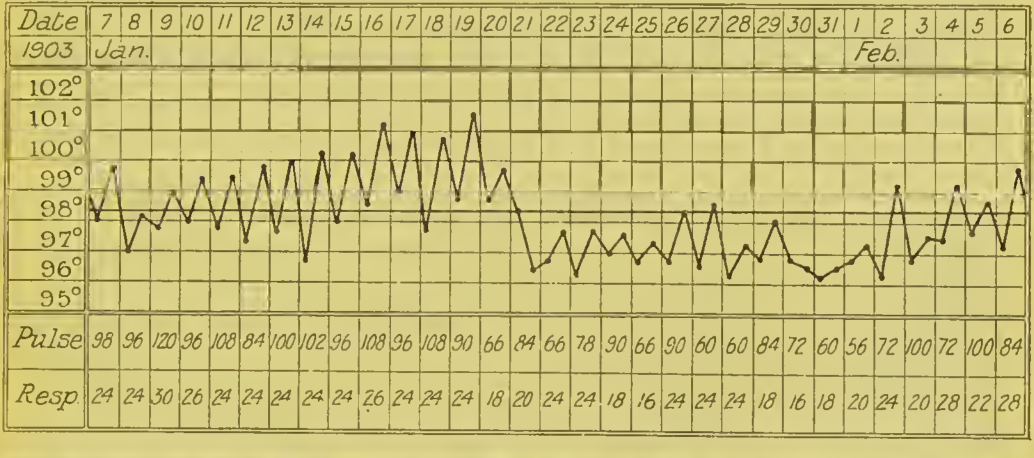
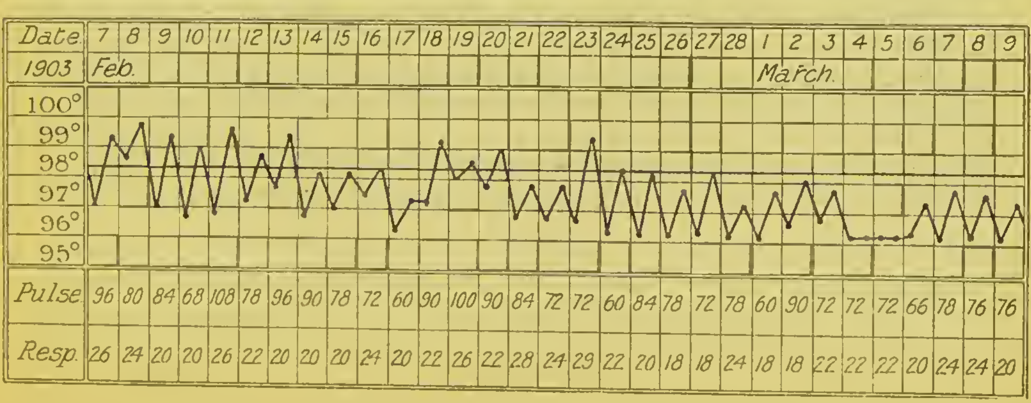
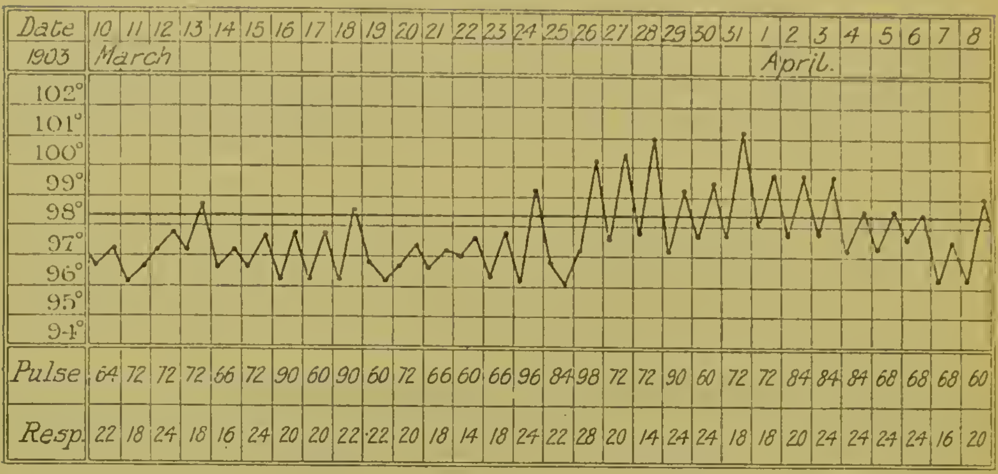
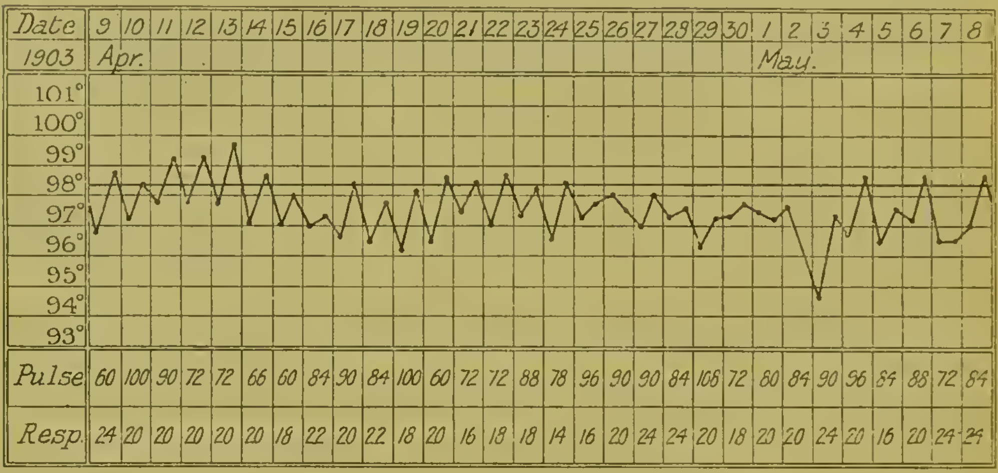
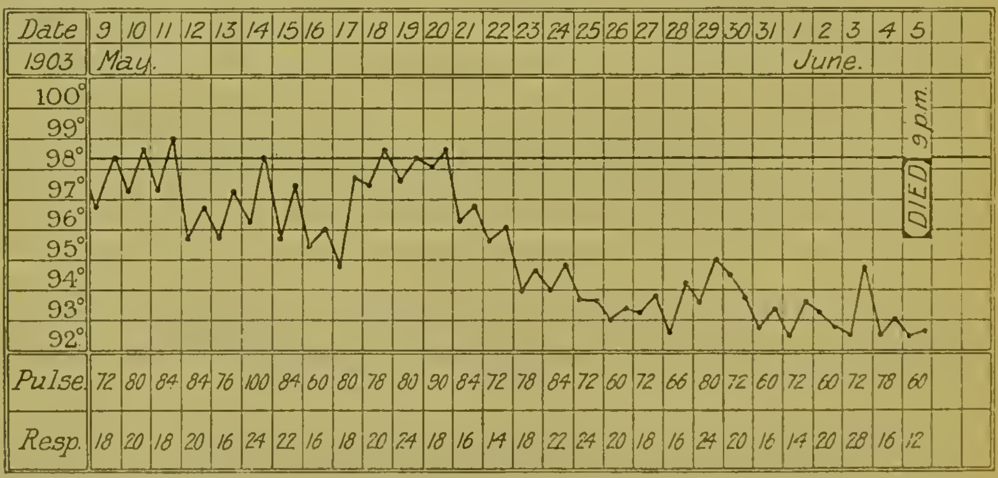
Pulse.
90 84 90 96 90 96 114 108 114 108 108 120 90 100 94 98 102 96 96 60 72 96 90 96 90 108 114 96 102 96 96
Resp.
24 24 24 22 26 30 26 24 32 20 24 28 28 28 24 24 26 26 34 24 22 24 24 28 24 28 24 24 26 26 24


Date
7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 6
1903
Jan.
Feb.
102°
101°
100°
99°
98°
97°
96°
95°
Pulse
98 96 120 96 108 84 100 102 96 108 96 108 90 66 84 66 78 90 66 90 60 60 84 72 60 56 72 100 72 100 84
Resp.
24 24 30 26 24 24 24 24 24 26 24 24 24 18 20 24 24 18 16 24 24 24 18 16 18 20 24 20 28 22 28


Date
7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 1 2 3 4 5 6 7 8 9
1903
Feb.
March.
100°
99°
98°
97°
96°
95°
Pulse
96 80 84 68 108 78 96 90 78 72 60 90 100 90 84 72 72 60 84 78 72 78 60 90 72 72 72 66 78 76 76
Resp.
26 24 20 20 26 22 20 20 20 24 20 22 26 22 28 24 29 22 20 18 18 24 18 18 22 22 22 20 24 24 20


Date 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 6 7 8
1903 March April.
102° 101° 100° 99° 98° 97° 96° 95° 94°
Pulse 64 72 72 72 66 72 90 60 90 60 72 66 60 66 96 84 98 72 72 90 60 72 72 84 84 84 68 68 68 60
Resp. 22 18 24 18 16 24 20 20 22 22 20 18 14 18 24 22 28 20 14 24 24 18 18 20 24 24 24 24 16 20


Date 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 1 2 3 4 5 6 7 8
1903 Apr. May.
101° 100° 99° 98° 97° 96° 95° 94° 93°
Pulse 60 100 90 72 72 66 60 84 90 84 100 60 72 72 88 78 96 90 90 84 108 72 80 84 90 96 84 88 72 84
Resp. 24 20 20 20 20 20 18 22 20 22 18 20 16 18 18 14 16 20 24 24 20 18 20 20 24 20 16 20 24 24


Date 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5
1903 May. June.
100° 99° 98° 97° 96° 95° 94° 93° 92°
9 p.m.
DIED
Pulse 72 80 84 84 76 100 84 60 80 78 80 90 84 72 78 84 72 60 72 66 80 72 60 72 60 72 78 60
Resp. 18 20 18 20 16 24 22 16 18 20 24 18 16 14 18 22 24 20 18 16 24 20 16 14 20 28 16 12

The following table shows the presence or absence of trypanosomes in the cerebro-spinal fluid and blood:—

Date.	Parasites in blood.			Parasites in cerebro-spinal fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Mar. 27					+
Apr. 9	+	—	—		+
Apr. 22		—			

June 6, 1903. *Post-mortem.*—14 hours after death.

The body is that of a well-nourished woman. No cutaneous eruptions or bed-sores present. Superficial lymphatic glands only slightly enlarged. Rigor mortis present.

Brain.—Dura mater healthy, but bulging slightly a little to the right of the longitudinal line, about 1 inch behind the coronal suture; this was due to dilated vessels. On cutting through the dura mater, the surface of the brain is seen to be congested, the vessels considerably dilated, and some of them containing decolourised thrombi. The brain looks dry; opaque and glassy-looking, a typical Sleeping Sickness brain, with increase of sub-arachnoid fluid and flattening of convolutions. On section the brain is normal throughout. Weight 2 lb. 10 oz.

Body opened in the usual way. There is a thick layer of subcutaneous fat all over the body. No free fluid in pericardial, pleural or peritoneal cavities.

Heart.—Excess of fat, especially about the right ventricle. Orifices and valves healthy. Muscular substance normal. No petechiæ. Weight 8 oz.

Lungs.—Left, no adhesions. Weighs 9 oz. Lower lobe slightly congested, otherwise normal. Right, no adhesions. Weighs 9 oz. Marked congestion of lower lobe and slight congestion of upper lobe.

Mediastinal and bronchial glands not enlarged.

Spleen.—Weight 7 oz. Substance firm. No excess of fibrous tissue. No pigmentation.

Liver.—Right lobe slightly adherent to diaphragm. Weight 2 lb. 9 oz. Looks healthy. Moderately firm.

Kidneys.—Each weighs 2 oz. Healthy on section. Capsules strip off readily. *Intestines.*—Healthy. *Mesenteric glands*, not enlarged, but much fat present.

Remarks.—This is a typical uncomplicated case of Sleeping Sickness, remarkable for its duration, the patient having been under observation in hospital for 7 months. At death there was no emaciation, on the contrary the girl remained plump and well nourished. The trypanosoma was not found in the blood, but only one examination was made.

CASE 20.—Seera (Male). Age 25 years. District Bussi. Occupation, Canoe man.

March 24, 1903. Admitted to hospital. Patient states that there had been no cases of Sleeping Sickness in the same house, and that he had been ill about 6 months. The first symptoms were weakness, then drowsiness.

April 7. Patient has a heavy look. His speech is weak, low, slow and indistinct.

April 17. The chief symptoms now are weakness, a heavy look, a weak, mumbling, indistinct and slow speech, and tremors of tongue, lips and the muscles of the limbs and trunk.

April 18. *Physical examination.*—Development and nutrition good. Gait weak and slightly shuffling. Intelligence fair. Expression of face, dull. There is a slight œdematous patch over tibia, probably due to chiggers. Lympahtic glands enlarged. No pain complained of. Pulse 90, weak and regular. Some pityriasis versicolour.

Nervous System.—Intelligence good. Memory good. Sleep; lies about all day, but does not sleep much.

Eyes.—No abnormality. Pupils respond to light.

Tremor of tongue marked, lips slight, hands marked. He has an involuntary movement of the right forefinger and right thumb as if trying to rub something off the thumb, or as if he were twisting a thread.

Reflexes.—Knee jerks increased. Elbow and wrist jerks also increased.

Alimentary System.—Has a good appetite. Tongue moist, slightly furred. Liver not enlarged. Spleen not palpable.

Heart.—Normal. Pulse 90, tension low. Size small, compressible and regular.

Respiratory System.—Nothing noteworthy.

Cutaneous System.—Nothing abnormal.

May 6. Patient's condition remains about the same. He often has a considerable rise of temperature at night. The blood has been examined five times with the centrifuge for trypanosomes, but unsuccessfully. He is in the second stage of the disease.

May 13. Patient is about the same. Tremor of tongue and lips. He has slight attacks of fever with rise of temperature at night. His gait and general nutrition still good.

May 29. Patient is still well nourished. His speech is slow, and expression dull.

June 3. General condition shows no alteration.

June 10. Examined blood by puncturing spleen. No trypanosomes.

,, 16. Patient appears more drowsy and dull.

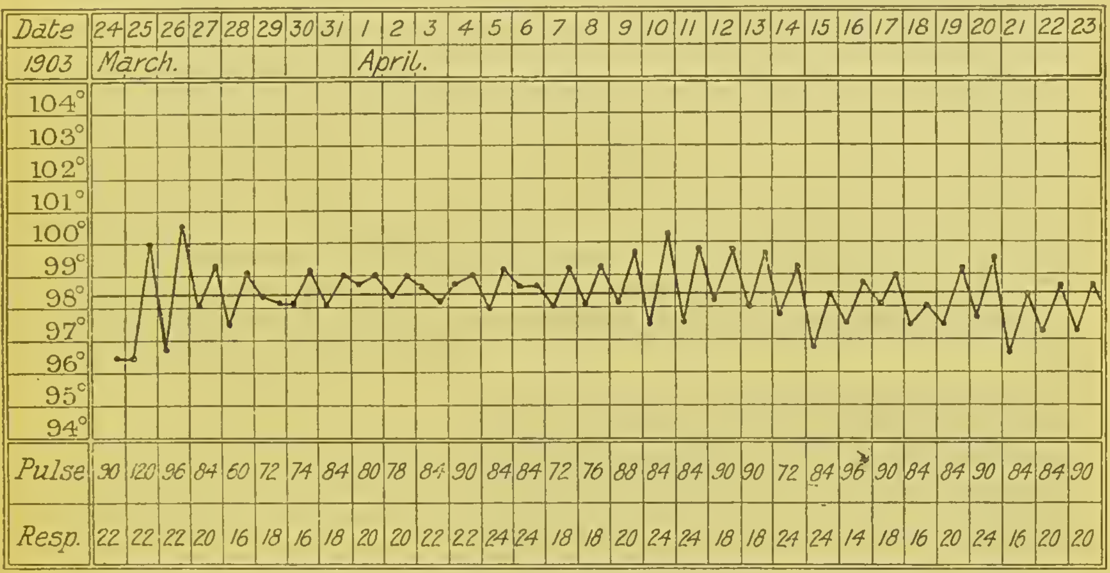
,, 20. Patient is getting more and more bed-ridden.

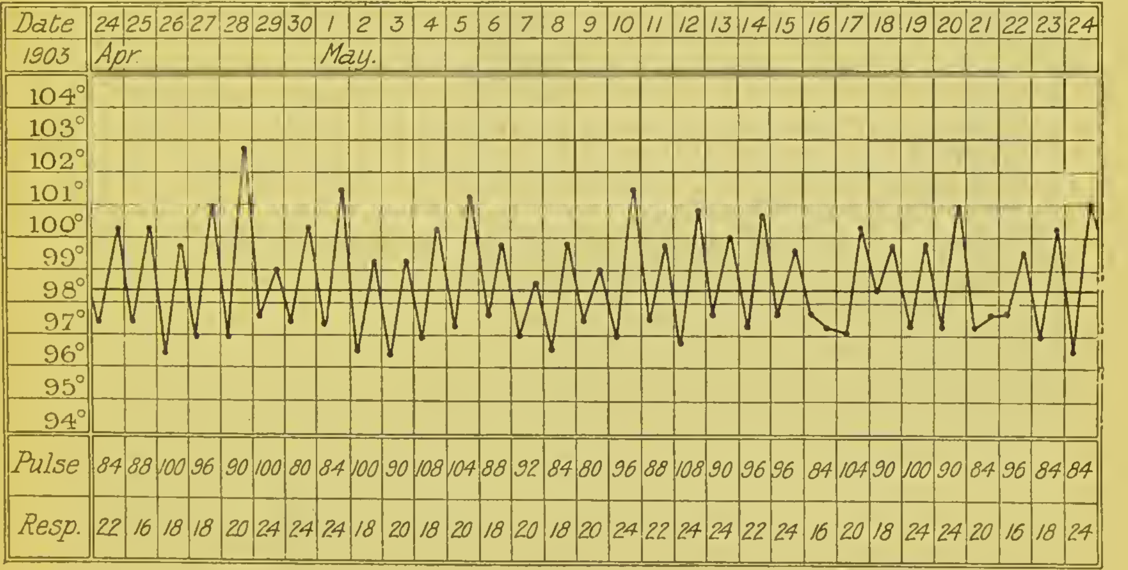
,, 24. Condition is more pronounced.

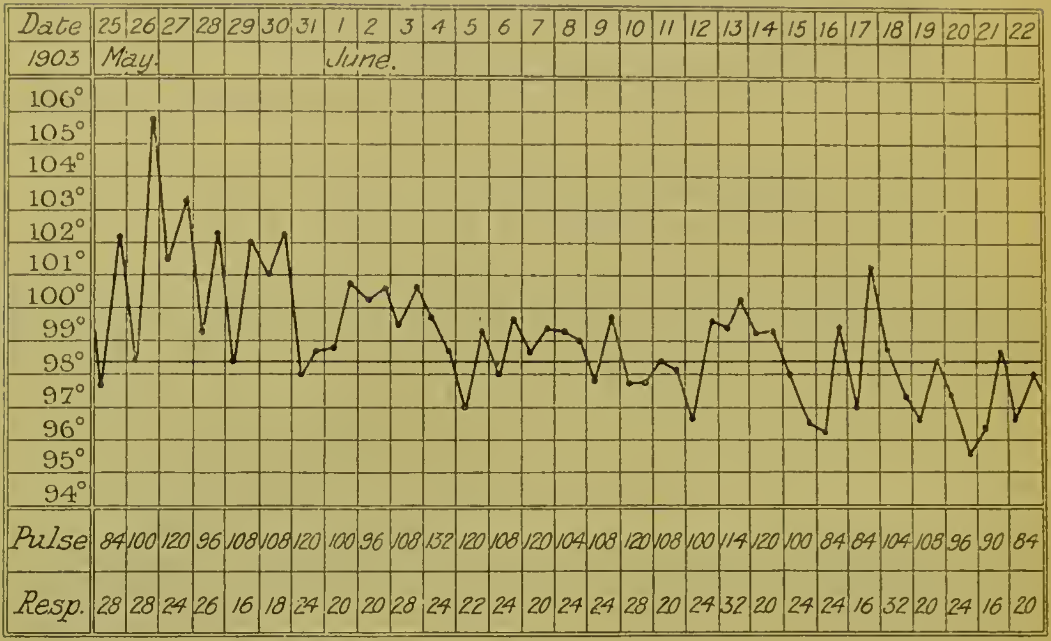
,, 28. Patient appears to be distinctly in the third stage of the disease.

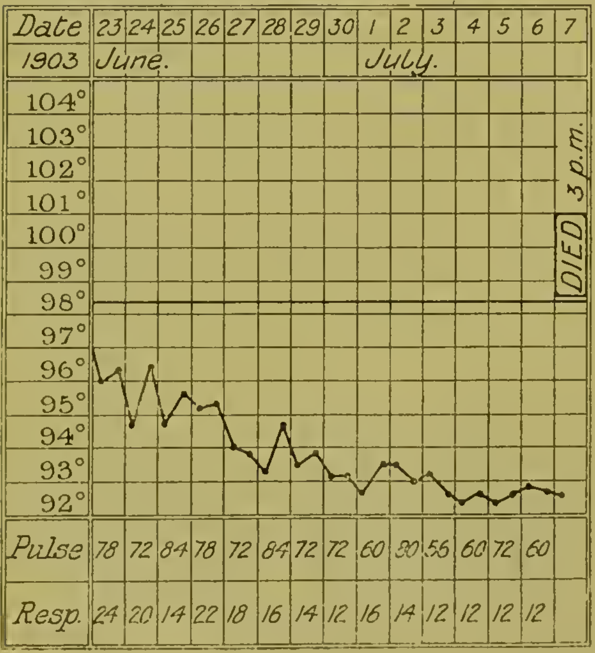
July 7. Died 3 P.M. No *post-mortem*.

The following chart represents the course of the disease :—






Date 25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
1903 May. June.
106°
105°
104°
103°
102°
101°
100°
99°
98°
97°
96°
95°
94°
Pulse 84 100 120 96 108 108 120 100 96 108 132 120 108 120 104 108 120 108 100 114 120 100 84 84 104 108 96 90 84
Resp. 28 28 24 26 16 18 24 20 20 28 24 22 24 20 24 24 28 20 24 32 20 24 24 16 32 20 24 16 20


Date 23 24 25 26 27 28 29 30 1 2 3 4 5 6 7
1903 June. July.
104°
103°
102°
101°
100°
99°
98°
97°
96°
95°
94°
93°
92°
DIED 3 p.m.
Pulse 78 72 84 78 72 84 72 72 60 30 56 60 72 60
Resp. 24 20 14 22 18 16 14 12 16 14 12 12 12 12

The following table shows the presence or absence of trypanosomes in the blood and cerebro-spinal fluid:—

Date.	Parasites in blood.			Parasites in cerebro-spinal fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Mar. 26					+
Apr. 9	–		–		
,, 17	+		–		
,, 21	+		–		
,, 22		–			
,, 27	+	–	–		
,, 30		–			
May 5			–		
,, 13	+	–	–		
,, 21	+	–	–		–
,, 30	+	–	–		+
June 10		–	–		

Remarks.—This is an ordinary uncomplicated case of Sleeping Sickness of long duration.

The remarkable point in it is that in spite of repeated examinations, the trypanosomes were never found in the blood. In the series of cases taken to show the presence or absence of the parasites in the blood, this was the only case which gave a negative result. Even puncturing the spleen and examining the pulp showed nothing.

CASE 13.—Esaka. Male. Age 25 Years.

March 25. Admitted to hospital.

April 4. *General Condition.*—State of development and nutrition good. Gait all right. Intelligence good. Expression of face bright, cheerful and smiling. No œdema. Lymphatic glands generally enlarged, slight to marked. Complains of frontal headache. Breathes normally. Pulse 100, normal. Temperature 102. No cutaneous eruptions.

Nervous System.—Intelligence good. Memory good. Sleeps well. No change in speech. Eyes normal.

Motor functions. Tremors. Tongue not marked, lips none, hands none. Muscular nutrition good. Sensory functions normal.

Reflexes. Knee jerk normal. No ankle clonus.

Alimentary System.—Appetite good. Tongue furred, moist. Teeth good. Abdomen normal. Stomach normal in size. Liver not enlarged. Spleen not palpably enlarged.

Circulatory System.—Heart. Apex beat between fourth and fifth ribs, ½ inch to right of nipple, not enlarged. Auscultation. Normal but distant. No bruits. Pulse 100. Tension good, size good, compression medium, rhythm regular.

Respiratory System.—Nothing noteworthy.

Skin.—The skin is normal, and there are no eruptions.

May 6. Patient is not so cheerful as on first coming into hospital. There is a slight tremor of the tongue, but none of fingers. His expression is wistful and rather miserable. His speech is good.

May 13. He still walks well and his speech is normal. He sleeps a good deal during the day.

May 16. Patient is getting rapidly worse. He remains in bed the greater part of the day. Tremor of tongue very marked.

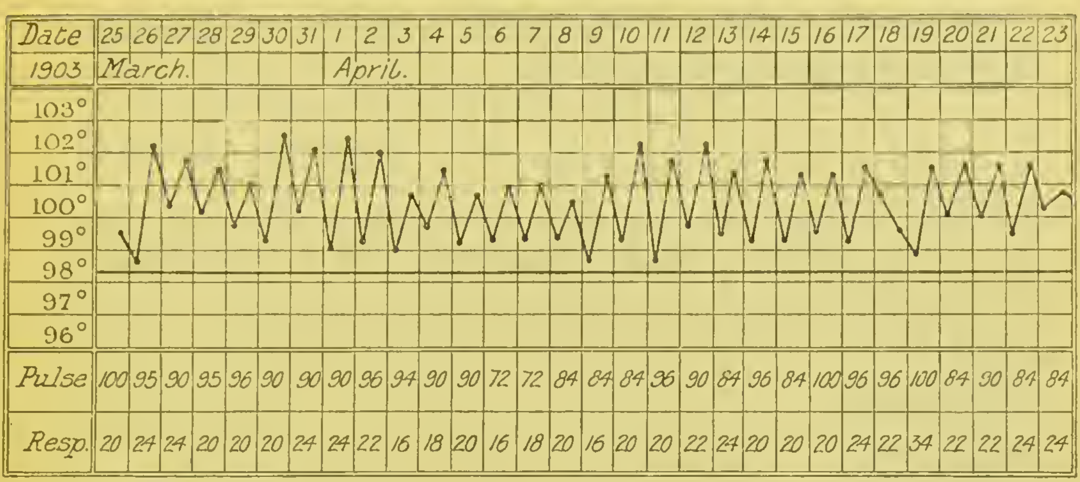
May 20. The temperature has been lower during the past week, and yesterday fell to 95° F. Marked tremors of tongue, but none of fingers. His gait is very hesitating. Expression wistful. Voice weak.

May 24. Patient is rapidly going down hill. This morning he is lying in bed in a dazed, semi-conscious condition, with his eyes wide open. When told to put out his tongue he tries to do so, but can protrude it only just beyond his teeth. He does not complain of any pain anywhere.

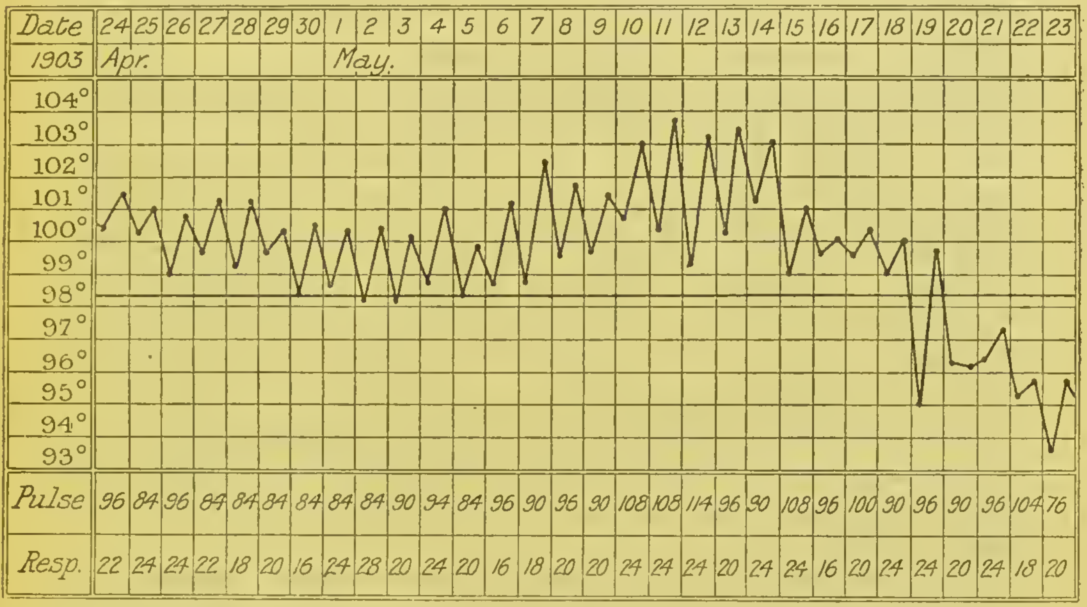
May 30. Condition worse. He lies in bed practically unconscious.

June 3. Died this morning at 7 A.M.

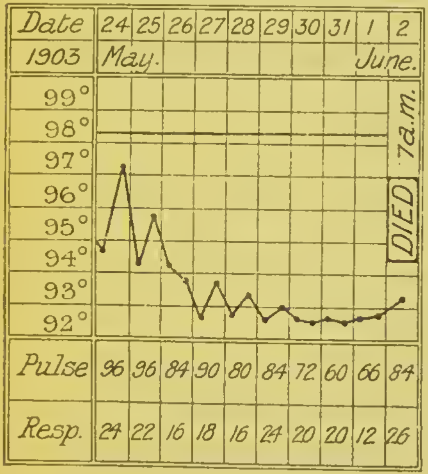
The following chart represents the course of the disease :—



Date	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1903	March.							April.																						
Pulse	100	95	90	95	96	90	90	90	96	94	90	90	72	72	84	84	84	96	90	84	96	84	100	96	96	100	84	90	84	84
Resp.	20	24	24	20	20	20	24	24	22	16	18	20	16	18	20	16	20	20	22	24	20	20	20	24	22	34	22	22	24	24



Date	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1903	Apr.							May.																						
Pulse	96	84	96	84	84	84	84	84	84	90	94	84	96	90	96	90	108	108	114	96	90	108	96	100	90	96	90	96	104	76
Resp.	22	24	24	22	18	20	16	24	28	20	24	20	16	18	20	20	24	24	24	20	24	24	16	20	24	24	20	24	18	20



Date	24	25	26	27	28	29	30	31	1	2
1903	May.								June.	
Pulse	96	96	84	90	80	84	72	60	66	84
Resp.	24	22	16	18	16	24	20	20	12	26

The following table shows the presence or absence of trypanosomes in the cerebro-spinal fluid and blood :—

Date.	Parasites in blood.			Parasites in cerebro-spinal fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Apr. 6....	+	−	−		+
„ 7....			−		
„ 18....	+		+		
„ 22....		−			
May 18....					+

June 3. *Port-mortem.*—9 hours after death.

The body is emaciated. Rigor mortis present. Abdomen retracted. Superficial lymphatic glands slightly enlarged.

Brain.—Weight 2 lb. 10 oz. There is considerable increase of subarachnoid fluid. Adhesion of arachnoid at one point near the middle of the median fissure. Pia mater looks like ground glass; sulci filled with fluid. On section numerous petechial hæmorrhages in the white matter of cerebrum. About 5 c.c. of fluid was obtained from the lateral ventricles. These is some congestion of the surface of the brain. Brain otherwise normal.

Heart.—No fluid in pericardium. Substance flabby, especially the right ventricle, and the wall is thin. No petechiæ. Valves of the right side normal. There are small atheromatous patches at the aortic orifice. Weight 8 oz.

Lungs.—No fluid in either pleural cavity. Slight adhesions on both sides. Left weighs 8 oz. Healthy on section. Right weighs 8 oz., also healthy on section.

Spleen.—Weight 1 lb. 8 oz. Substance firm, increase of fibrous tissue. Slight pigmentation.

Liver.—Weight 3 lb. 4 oz. Healthy on section.

Mesenteric Glands.—Only slightly enlarged.

Kidneys.—Each weigh 4 oz. Normal on section. Capsule strips off readily.

The 5 oz. of fluid from left lateral ventricle were centrifuged, and living trypanosomes were found 10 hours after death.

CASE 21.—Kidorme (Male.) Age 20. District, Bussi. Occupation, Leadworker. Food, Fish, Sweet Potatoes and Bananas.

March 24, 1903. Admitted to hospital. Patient states that his illness began with cough and pain in his chest, and that he has been ill about 3 months.

April 7. He is weak on his legs, being only able to totter along. There is tremor of the fingers. His pupils are equal and normal. His speech is indistinct, weak and monotonous.

April 22. *General Condition.*—He is well nourished. His gait is weak and uncertain, he walks carefully with bent legs. He is intelligent, and the expression of his face is fairly bright. There is no œdema anywhere. The mucous membranes are normal. No trophic changes. Lymphatic glands are generally enlarged, about the size of beans in the inguinal region. He does not complain of any pain.

Nervous System.—Intelligence and memory are good. He lies about all day, but does not sleep much during the day. Speech, rather weak and indistinct. Eyes normal. Tongue jerky. Tremor of lips and hands and generally of body. His sensibility to touch is normal, as also is his muscle sense. Knee jerks are present. Ankle clonus absent.

Alimentary System.—His appetite is good, tongue moist, furred, and gums are healthy. The liver and spleen are not enlarged. Bowels regular, with use of medicine.

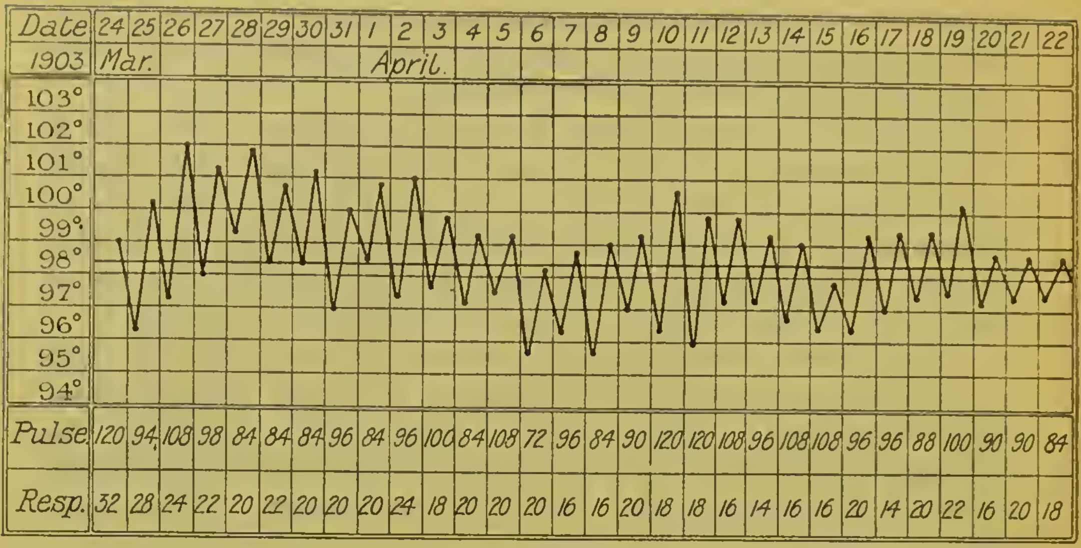
Circulatory System.—Apex beat is imperceptible. Heart sounds weak. No bruit. Pulse 120. Small, tension low, compressible, rhythm irregular.

Respiratory System.—Nothing abnormal.

Cutaneous System.—Nothing abnormal.

June 10. Died 10 P.M.

The following chart represents the course of the disease:—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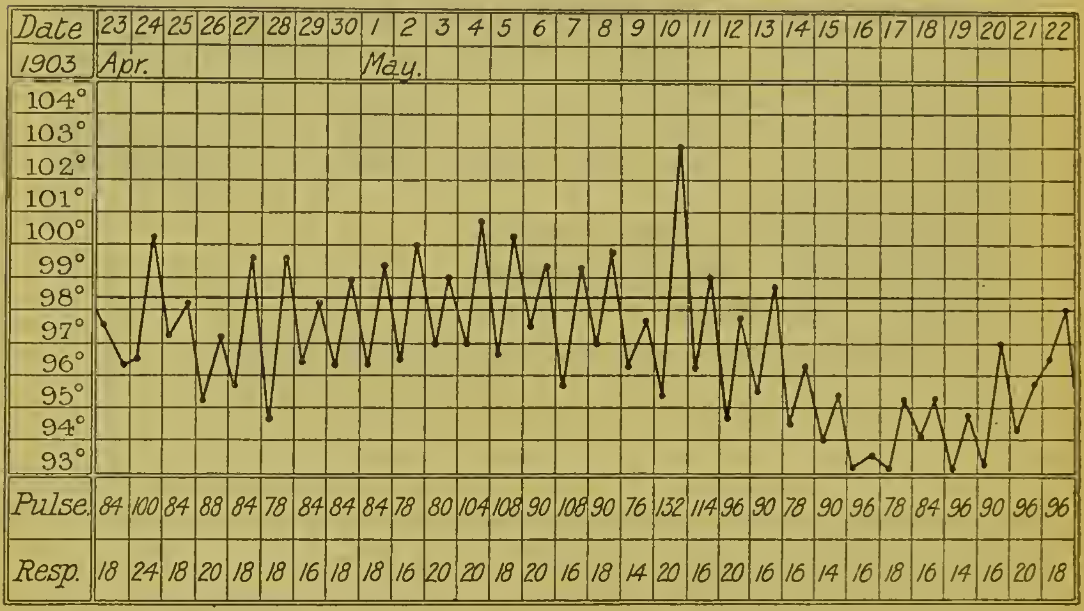
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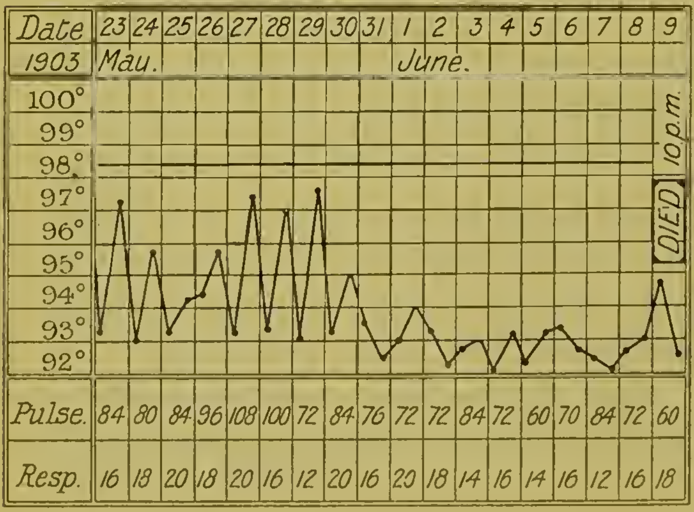
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Resp. 16 18 20 18 20 16 12 20 16 20 18 14 16 14 16 12 16 18

The following table shows the presence or absence of trypanosomes in the cerebro-spinal fluid and blood:—

Date.	Parasites in blood.			Parasites in cerebro-spinal fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Mar. 28					+
Apr. 18	+		+		
„ 22		−			

June 10. *Post-mortem.*—14 hours after death.

The body is that of a fairly well-nourished young man of about 20 years of age. Rigor mortis well marked. A slight superficial bed sore is seen over the lumbar region. Slight general enlargement of the lymphatic glands. Pupils equal and normal.

Brain.—On opening the calvarium the dura-mater appears healthy, and there are no adhesions between it and the brain.

The surface of the brain has the typical Sleeping Sickness appearance. The vessels are injected, the convolutions are flattened, and the sulci are filled with an excess of sub-arachnoid fluid, giving them a ground-glass appearance. On section the white matter shows congested points, the lateral ventricles contain about 6 c.c. of cerebro-spinal fluid, otherwise the brain appears healthy to the naked eye.

Thorax.—No fluid in either pleural or pericardial cavities.

Heart.—Weighs 8 oz. There is a slight excess of fat in the epicardium. There are no petechiæ and nothing abnormal, except a slight deposit of atheroma at the beginning of the aorta.

Lungs.—Left weighs 1 lb. There is some congestion of the lower lobe, otherwise the organ appears healthy. Right weighs 1 lb., and is in the same condition as the right.

Liver.—Weighs 3 lb. 2 oz. The surface is somewhat rough to the touch, like Morocco leather. On section the lobules stand out rather prominently, due probably to dilated peripheral capillaries. There are dark ramifying lines, evidently of fibrous tissue, enclosing several lobules, a commencing coarse cirrhosis. The tissue is bile stained, exceedingly tough, and there is probably some fatty degeneration.

Spleen.—The spleen weighs 8 oz. It is somewhat enlarged. It is pigmented and softened.

Kidneys.—Each weighs 4 oz. Capsules strip off readily. On section the tissue appears healthy.

Alimentary System.—The mesenteric glands are enlarged to the size of beans. The intestines appear healthy.

Remarks.—An ordinary uncomplicated case of Sleeping Sickness.

The accompanying photograph was taken of Kidorme a month before he died, and it must be admitted his appearance is that of an ordinary healthy native (see Plate 3).

CASE 14.—Benjameni (Male). Age 24 years. District, Bussi. Food, Fish, Bananas and Sweet Potatoes.

March 24, 1903. Admitted to hospital. Patient states that there have been no other cases of Sleeping Sickness in his house. The first symptom he noticed was that he began to sleep during the day more than usual.

April 7. This man is thin and badly nourished. His gait is ordinary. He seems intelligent, and there is nothing peculiar about the expression of his face. No œdema of any part. Lymphatic glands are enlarged generally to the size of peas, and in the inguinal and femoral regions to the size of beans.

Nervous System.—His speech is decidedly weak, but distinct enough. No tremors of the tongue or lips, but some slight tremor seen in the hands. Knee jerks are present. Ankle clonus absent.

Alimentary System.—Tongue moist and slightly furred. Lips cracked. Liver not enlarged.

Circulatory System.—Apex beat seen in the third space. Sounds normal. Pulse 108. Tension medium, size small, compressibility moderate, regular.

May 6. Patient is getting thinner and weaker. He seldom leaves his bed now. The tremors of hands, tongue, and body are very marked. He is passing into the third stage of the disease.

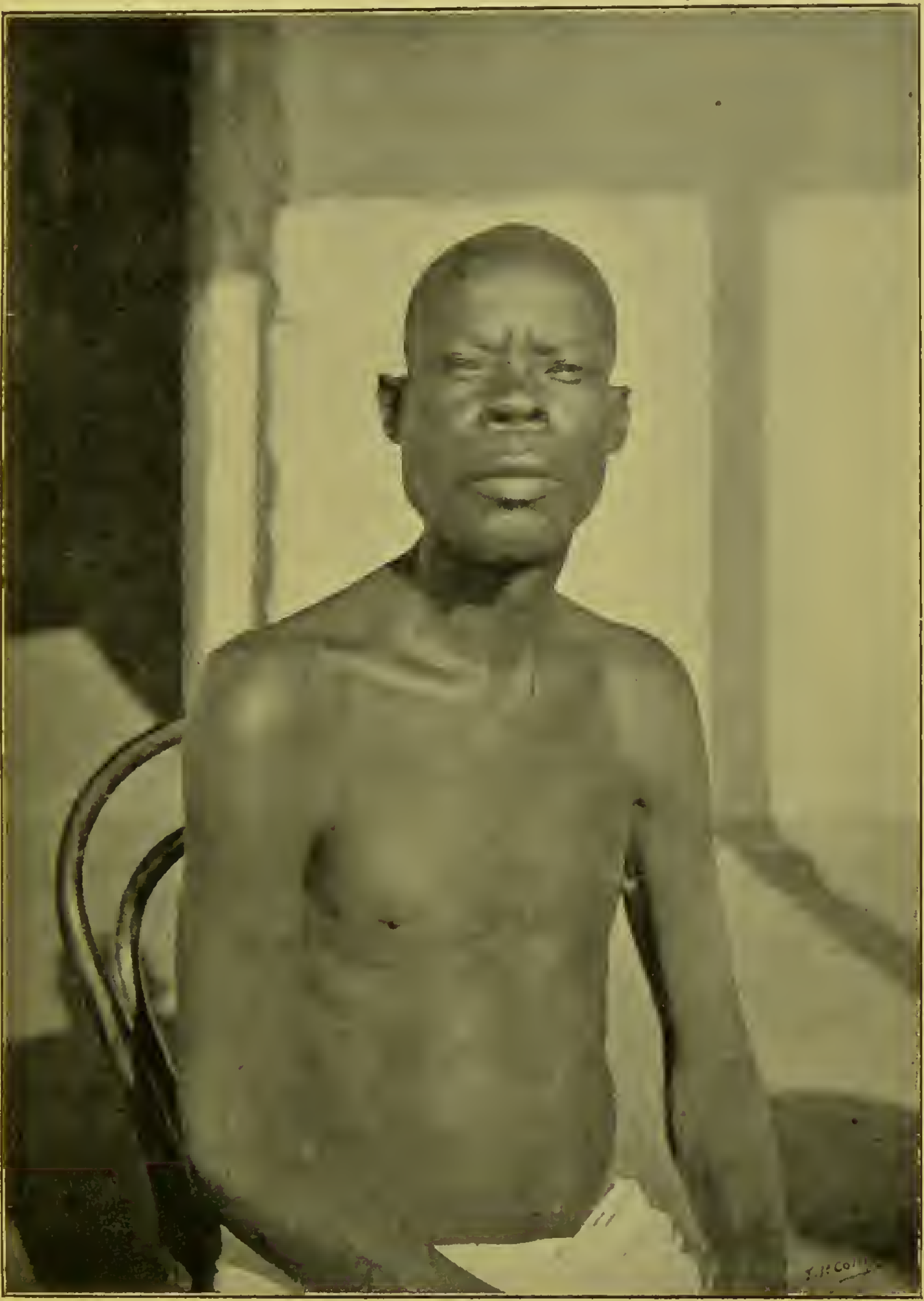
May 13. Patient is distinctly better than he was last week. He gets up every day.

May 20. Patient still gets up every day, but is very feeble.

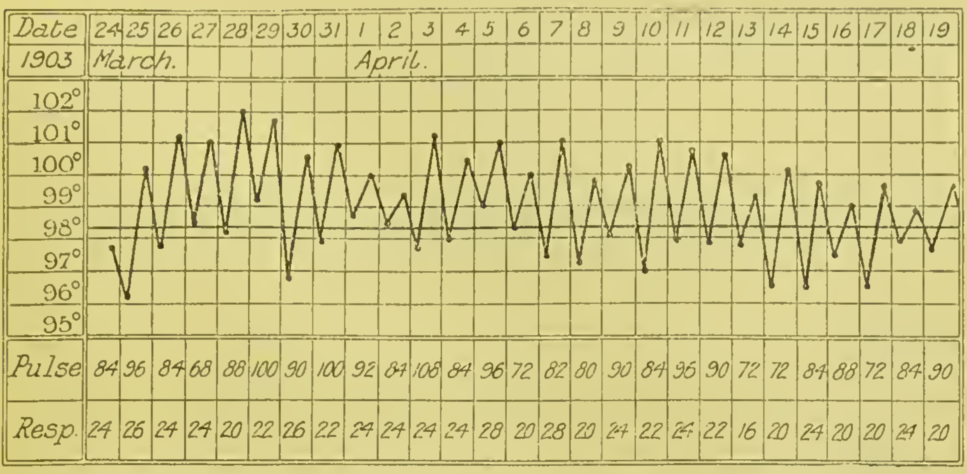
May 29. Appears worse, is very feeble, and unable to speak.

May 30. Died 11 P.M. No *post-mortem.*

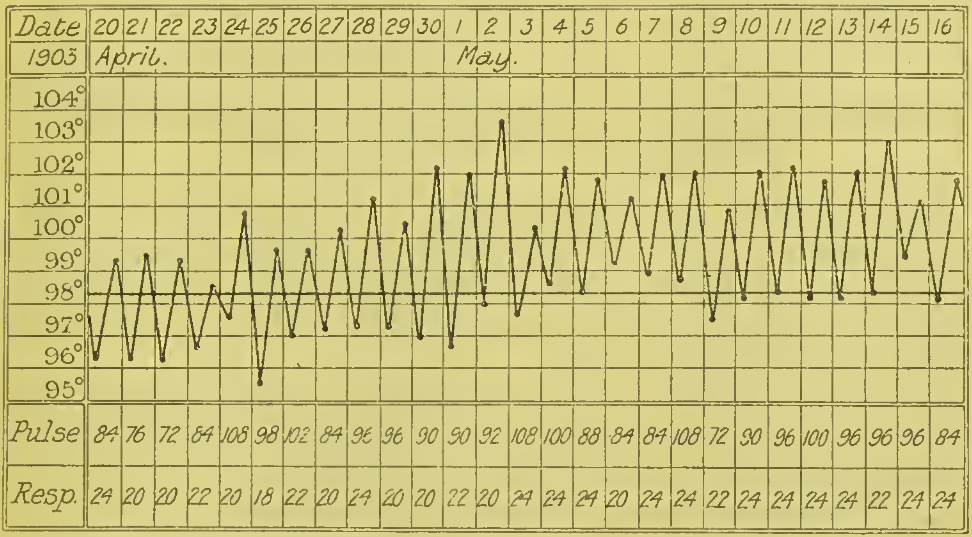
The following chart represents the course of the disease :—



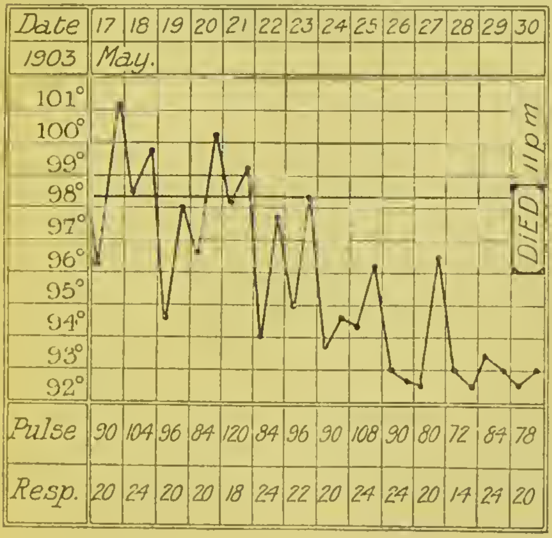
KIDORME, CASE 21.



Date	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1903	March.								April.																		
Pulse	84	96	84	68	88	100	90	100	92	84	108	84	96	72	82	80	90	84	96	90	72	72	84	88	72	84	90
Resp.	24	26	24	24	20	22	26	22	24	24	24	24	28	20	28	20	24	22	24	22	16	20	24	20	20	24	20



Date	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1903	April.											May.															
Pulse	84	76	72	84	108	98	102	84	96	96	90	90	92	108	100	88	84	84	108	72	90	96	100	96	96	96	84
Resp.	24	20	20	22	20	18	22	20	24	20	20	22	20	24	24	24	20	24	24	22	24	24	24	24	22	24	24



Date	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1903	May.													
Pulse	90	104	96	84	120	84	96	90	108	90	80	72	84	78
Resp.	20	24	20	20	18	24	22	20	24	24	20	14	24	20

The following table shows the presence or absence of trypanosomes in the blood and cerebro-spinal fluid:—

Date.	Parasites in blood.			Parasites in cerebro-spinal fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Mar. 25				–	–
,, 28				–	–
Apr. 1				–	–
,, 7	–		–		
,, 13				–	+
,, 16	–		+		
,, 22		–			

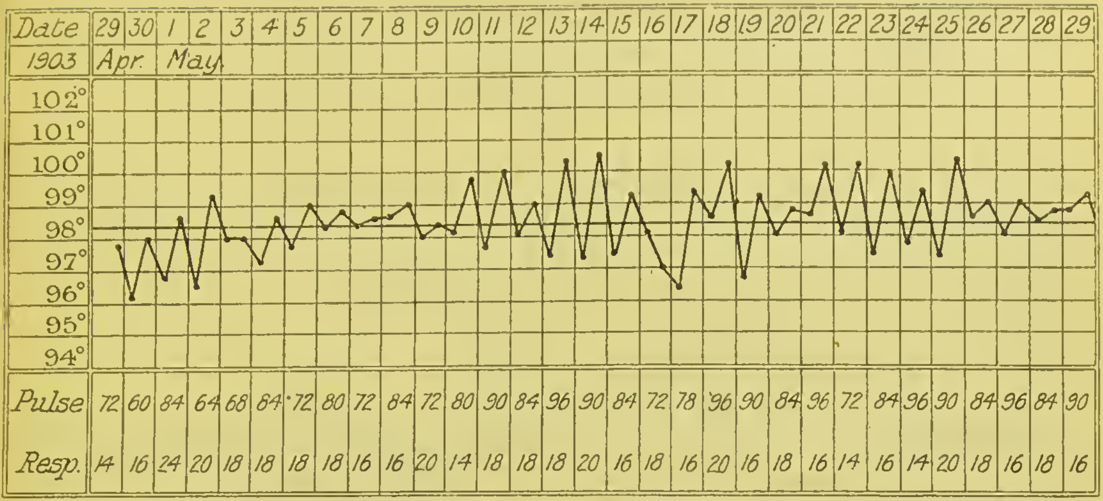
CASE 79.—Festo (Male). Age 20 years. District, Kampala. Occupation, House-boy to a Missionary, for 1½ years.

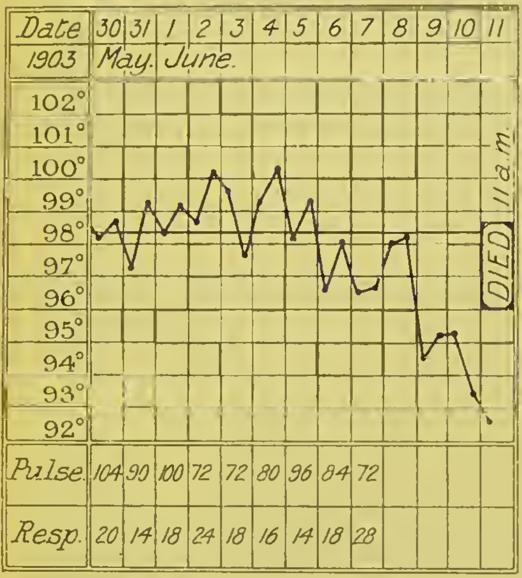
April 29, 1903. Admitted to hospital. Patient states that he has been ill about 1 month, that there had not been any other cases in the same house. A brother died of Sleeping Sickness 4 years ago at Chagwe. The first symptoms were headache and fever. Afterwards he felt drowsy during the day.

He is well nourished, but has a dull, heavy, sad expression. His speech is very weak, indistinct, and high pitched. He has tremors of tongue, lips, and slightly of hands. Pulse 120, weak, compressible. Heart. Normal no bruit. Gait weak and uncertain.

May 30. Trypanosomes *present* in cerebro-spinal fluid.

The following chart represents the course of the disease:—





Case 44.—Nakaiba (Female). Age 10 years. District, Kampala.

April 6, 1903. This child on admission to hospital presented no perceptible signs of Sleeping Sickness, but on examining the cerebrospinal fluid, taken by lumbar puncture, trypanosomes were found.

April 29. *General Condition.*—A well-nourished child. Gait feeble, hesitating. Intelligence good. Expression not noteworthy. No œdema. Enlarged glands felt in inguinal and femoral regions, not elsewhere.

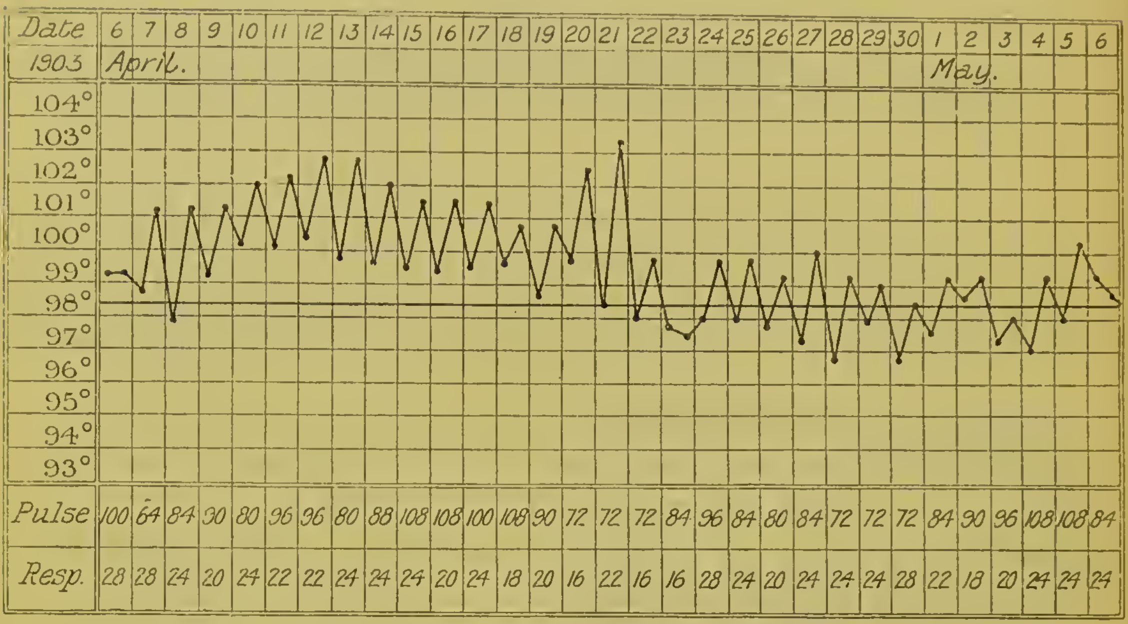
Nervous System.—Intelligent. Sleeps a good deal during the day. Speech, weak but distinct. No tremors of tongue, lips or hands. Knee jerks present. Ankle clonus absent.

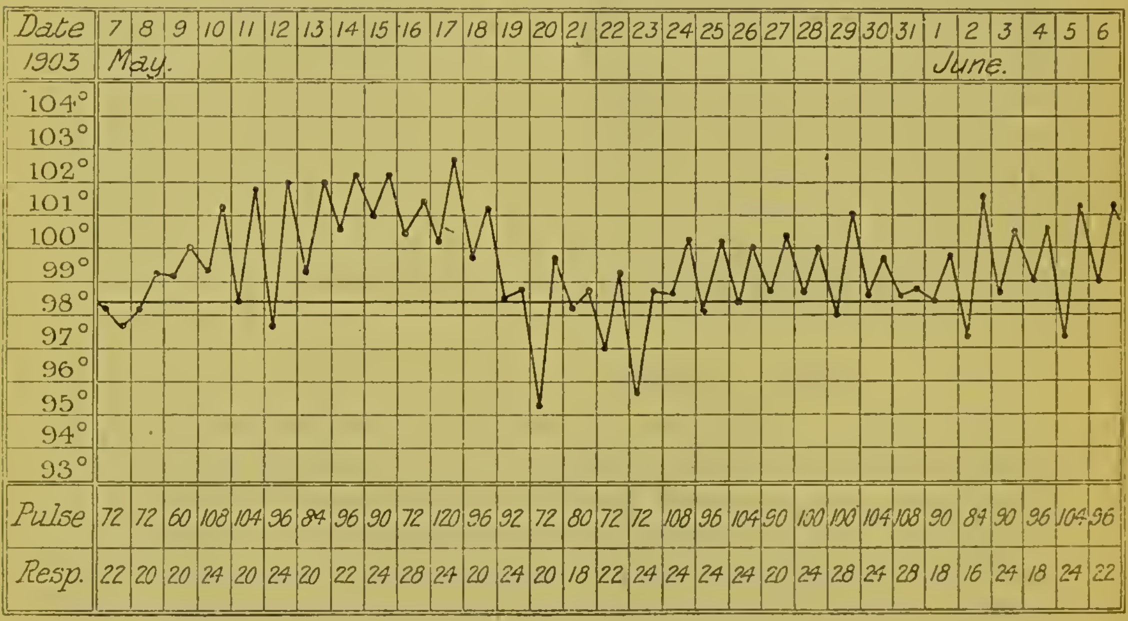
Alimentary System.—Tongue moist, furred. Liver and spleen not enlarged.

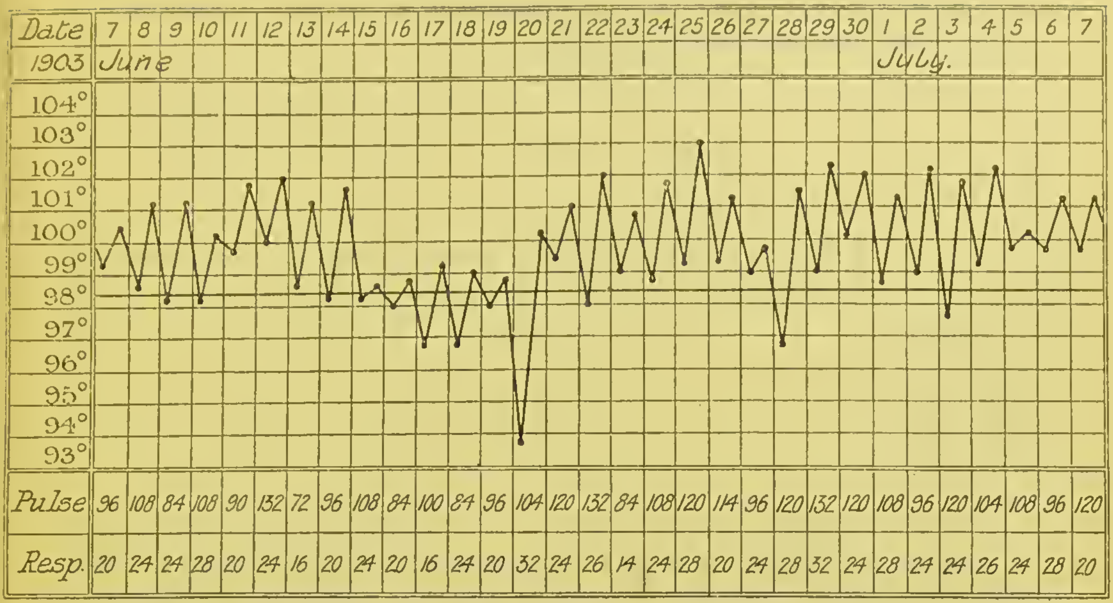
Circulatory System.—Heart, sounds normal. Pulse 100. Nothing noteworthy. *Cutaneous System.*—Normal. No eruptions.

July 22. Died 8 A.M. *No post-mortem.*

The following chart represents the course of the disease:—



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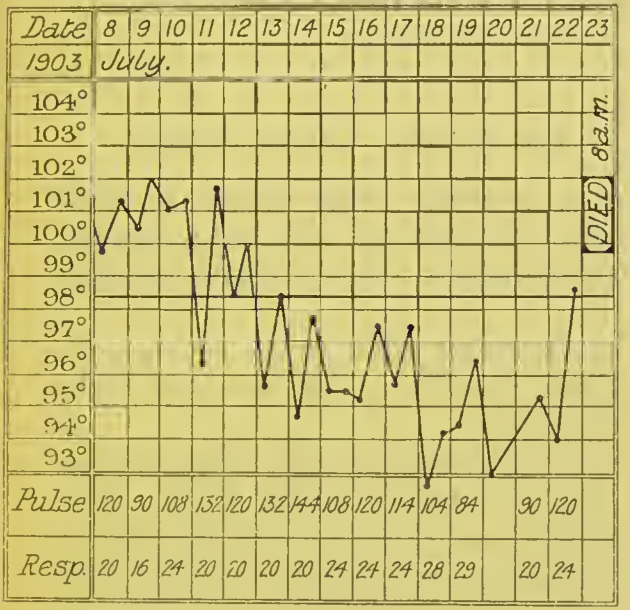
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The following table shows the presence or absence of trypanosomes in the blood and cerebro-spinal fluid:—

Date.	Parasites in blood.			Parasites in cerebro-spinal fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Apr. 6....					+
,, 22....		–			
May 12....		–	+		
,, 13....		--			

Remarks.—This is an ordinary uncomplicated case of Sleeping Sickness of long duration. During the first months the patient remained plump and cheerful, but during the last few weeks she went down hill rapidly, became extremely emaciated and bed sores formed.

Case 152.—Sabiri (Male). Age 16 years. District, Busoga.

July 20, 1903. Admitted to hospital. This patient is much emaciated, he can scarcely walk. His eyes are wide open, staring. There is no tremor of the tongue or fingers. He is evidently entering the third stage.

July 27. His eyes are staring, he drinks milk out of a feeder. He can hardly walk. He complains of pains in his back and right shoulder blade. There is no headache.

August 3. During the past week, patient has got rapidly worse. He is drowsy and lies with his eyes closed, but not asleep. This morning there is a green purulent discharge from the left nostril. There is great swelling of all the glands on the right side of the neck and jaw and retraction of the head. The eyes are to-day again widely open and patient moans constantly as if in great pain. He will not take any food now. He is in the third stage and practically moribund.

August 4. Patient died last night at 7 P.M.

The following chart represents the course of the disease:—

COLLEGE [illegible]
OF
[illegible]

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